2. WATERSHED CHARACTERISTICS

Basic watershed information for the four drainage basins are discussed in this chapter. General basin characteristics are highlighted along with topographical features. The distribution of hydrologic soil groups (based on soil permeability as described in Table 2.0-1) is presented. The City map provided on Figure 2-1, displays the soil groups and main hydrologic features. Hydrologic features of the basins are presented and land use patterns are described. Finally, various issues that must be taken into account during the design process are illustrated.

Table 2.0-1. Hydrologic Soil Groups

Group	Infiltration Rate	Examples
A	High (>0.30 in/hr)	Sand, loamy sand, and sandy loam
B	Moderate (0.15 to 0.30 in/hr)	Silty loam and loam
C	Slow 0.05 to 0.15 in/hr)	Sandy clay loam
D	Very Slow (<0.05 in/hr)	Clay loam, Silty clay loam, sandy clay, silty clay, and clay

2.1 Project Basin Features (Basin A)

Basin A encompasses all areas in the City that drain into the Pacific Ocean via the Buena Vista Creek and the Buena Vista Lagoon; the Buena Vista Creek originates northeast of the City of Vista. The basin location, soil types, and hydrologic features are presented on Figure 2-2.

2.1.1 General Basin Characteristics

Basin A is located in the northern portion of the City. It is bound by Route 78 and the border with the City of Oceanside in the North; the Pacific Ocean in the West; Carlsbad Village Drive, Basswood Avenue and Chestnut Avenue in the South; and College Boulevard in the East. Basin A is the smallest basin within the Carlsbad drainage area, occupying 2270 acres - 9 percent of the total city acreage.

2.1.2 Geography and Topography

Basin A elevations range from 450 feet to sea level. The topography slopes down to Buena Vista Creek in the northern portion of the basin. A few canyons are located in the eastern portion of the basin; the western portion is predominantly flat coastal plain. Multiple Hydrologic Soil Groups are present in Basin A. The eastern portion of the basin is a combination of Group C and D. The western portion of the basin is a combination of Group A and Group C.

2.1.3 Hydrologic Features

The Buena Vista Creek originates northeast of the City of Vista and runs through the northern section of the City of Carlsbad. Along the way, it drains a nine-mile long, two-mile wide area measuring approximately 23 square miles (14,437 acres) (CWN, 2006). Several small tributaries combine into an improved channel that flows for three miles in a southwest direction through the City of Vista, entering the City of Carlsbad thereafter. Buena Vista Creek eventually discharges into the manmade Buena Vista Lagoon, which has a

50-foot weir structure that is barely visible when the lagoon is at normal levels (BVLF, 2006). The weir structure dams up the water flowing westward towards the Pacific Ocean, thus controlling the minimum water level in the lagoon.

2.1.4 Land Use

The major land use in Basin A is residential – mostly low to medium residential. There is some high density residential development west of Interstate 5. In addition, a portion of the area, designated by the City as the downtown business district, is located in Basin A near Interstate 5. Twenty-three percent of the basin is designated as open space, which is mainly located near the lagoon and its tributaries.

2.1.5 Design Sensitivities

The typical life cycle of a project begins by determining a need for a facility. Once the facility has been justified, the design process can begin. However, during the design process, certain environmental constraints, such as coastal and flood zones, wetlands, habitat for protected species, open space, and the impacts to industrial and residential areas, must be taken into account. To mitigate for some of these constraints, the design must address impacts to site conditions, aesthetics, noise mitigation, sediment reduction and/or containment and the timing or season of the proposed construction activity. These potential environmental factors must be considered during design process and must be negotiated or approved by the appropriate regulatory agency prior to construction. Potential constraints and permits within Basin A include, but are not limited to, the following:

- Coastal Development Permit from the California Coastal Commission
- Streambed Alteration Agreement from the California Department of Fish and Game
- Water Quality Certification from the Regional Water Quality Control Board
- Wetland Delineation Studies from the Army Corps of Engineers

2.2 Project Basin Features (Basin B)

Basin B includes the area of the City that drains to Agua Hedionda Creek and Lagoon. The basin location, soil types, and hydrologic features are presented on Figure 2-3.

2.2.1 General Basin Characteristics

The eastern boundary of Basin B extends from Palomar Airport Road, at the junction where the City of Vista and the City of San Marcos meets and stretches northerly to the City of Oceanside. The boundary on the north roughly follows Carlsbad Village Drive, Basswood Avenue and Chestnut Avenue. The southern boundary incorporates Palomar Airport Road, Cannon Road, and College Boulevard. Basin B occupies about 9,340 acres or about 37 percent of the total City land.

2.2.2 Geography and Topography

Basin B elevations range from 582 feet to sea level. Steep hillsides exist east of Interstate 5. Intermittent streams form in low areas in the upper reaches of the watershed feeding the perennial Agua Hedionda Creek. In addition, the basin includes Calaveras Lake and Squires Reservoir, which are located on the eastern edge of the basin. Water in the Squires Reservoir is treated and used for potable uses by City residents (CWN, 2006). Hydrologic soil groups range from Group A to Group D. Group A is mainly present in the western coastal plain; Group B is found in the eastern portion of the basin where Agua Hedionda Creek flows into the City from the City of Vista. Group C and Group D soils are found in the eastern portion of the watershed.

2.2.3 Hydrologic Features

The Agua Hedionda Creek originates south of the San Marcos Mountains and, together with its major tributary, the Buena Creek, drains an area measuring approximately 29 square miles (18,837 acres) (CWN, 2006). After merging with the Buena Creek three miles downstream of the origin, the Agua Hedionda Creek runs six miles before reaching the Agua Hedionda Lagoon. Approximately, 1.4 miles upstream from Agua Hedionda Lagoon, Calaveras Creek (which originates from Calaveras Lake) discharges into Agua Hedionda Creek. Agua Hedionda Lagoon has an approximate channel distance of two miles.

2.2.4 Land Use

A portion of downtown Carlsbad is located in Basin B. Additional commercial districts are scattered throughout the basin, mainly concentrating around Interstate 5. North of Aqua Hedionda Lagoon, the major land use is residential. High density residential is located along the coast and low-medium residential is sited inland. McClellan-Palomar Airport is located in the southern portion of the basin and is surrounded by industrial areas. Twenty nine percent of Basin B is designated as open space, primarily located around the lagoon.

2.2.5 Design Sensitivities

Potential environmental factors that must be considered during design process and must be negotiated, approved, or permits secured from the appropriate regulatory agency prior to construction within Basin B include, but are not limited to, the following:

- Coastal Development Permit from the California Coastal Commission
- Streambed Alteration Agreement from the California Department of Fish and Game
- Water Quality Certification from the Regional Water Quality Control Board
- Wetland Delineation Studies from the Army Corps of Engineers

2.3 Project Basin Features (Basin C)

Basin C encompasses the area of Carlsbad that drains into Encinas Creek. The basin location, soil types, and hydrologic features are presented in Figure 2-4.

2.3.1 General Basin Characteristics

Basin C is located in the center of the City and comprises approximately 2,580 acres of land, or 10 percent of the entire city area. The northern boundary includes Palomar Airport Road, Cannon Road, and College Boulevard. The western boundary is the Pacific Ocean, while the southern boundary follows Poinsettia Lane and El Camino Real. Palomar Airport Road runs through the center of the Basin.

2.3.2 Geography and Topography

Topographically Basin C has more gradual elevation change than the other basins, starting with a peak elevation of 410 feet and ending at sea level. Encinas Creek, located at the center of the basin, serves as the main collector of basin stormwater runoffs. Existing soil types include Group A and D. Group D soils can be found predominately east of Interstate 5, while Group A soils are located in the coastal plain. A small sliver of Group B soils is located along Encinas Creek.

2.3.3 Hydrologic Features

The Encinas Creek originates 3,000 feet east of El Camino Real in a small drainage behind an industrial park and runs in a channel west to the Pacific Ocean. The drainage basin for Encinas Creek covers an area approximately five square miles (3,434 acres). The drainage course generally parallels Palomar Airport Road along an alignment just south of this roadway and runs for 3 miles. Encinas Creek does not end in a lagoon but flows into the Pacific Ocean after crossing Interstate 5 and Carlsbad Boulevard (Pacific Highway) (CWN, 2006).

2.3.4 Land Use

Basin C consists mainly of residential land uses. High density residential is focused around the coast with low and medium residential located just east of Interstate 5. The eastern portion of the basin near McClellan-Palomar Airport is planned for industrial uses. Industrial uses will constitute 35 percent of the basin land uses and multiple industrial and office parks have already been constructed. The open space allocation for this basin is 887 acres or 13% of the total acreage.

2.3.5 Design Sensitivities

Potential environmental factors that must be considered during design process and must be negotiated, approved, or permits secured from the appropriate regulatory agency prior to construction within Basin C include, but are not limited to, the following:

- Coastal Development Permit from the California Coastal Commission
- Streambed Alteration Agreement from the California Department of Fish and Game
- Water Quality Certification from the Regional Water Quality Control Board
- Wetland Delineation Studies from the Army Corps of Engineers

2.4 Project Basin Features (Basin D)

Basin D includes the part of the City that drains to Batiquitos Lagoon and its tributaries. The basin location, soil types, and hydrologic features are presented in Figure 2-5.

2.4.1 General Basin Characteristics

Basin D is located in the southern portion of the City. Its southern boundary includes La Costa Avenue and follows the border with the City of Encinitas and the County of San Diego. The western boundary is the Pacific Ocean. The Northern boundary includes Poinsettia Lane and El Camino Real. The eastern boundary follows Rancho Santa Fe Road and again follows the City's border with the City of Encinitas and the County of San Diego. Basin D is the largest basin with acreage of 10,907 acres, which is 43 percent of the total area of the City.

2.4.2 Geography and Topography

The highest elevation point in Basin D is 994 feet. The lowest elevation point is sea level. Numerous steep ravines are located in the eastern portion of the basin. The topography forms various natural drainage patterns that produce intermittent streams that flow into the lagoon and creeks. The soil types are mainly Group A in the western portion of the basin and in the streambeds of the creeks /ephemeral tributaries. Some of the drainage areas contain Group C soils. The eastern slopes are Group D soils.

2.4.3 Hydrologic Features

The San Marcos Creek and the Encinitas Creek are the two major water courses in the Batiquitos Lagoon watershed. The entire drainage area encompasses 56 square miles (CWN, 2006). San Marcos Creek originates in the coastal mountain range northeast of San Marcos, while Encinitas creek originates in the mountains southwest of San Marcos. Both creeks discharge into Batiquitos Lagoon. The lagoon extends 2.6 miles to the Pacific Ocean and covers about 0.95 square miles (600 acres). The capacity of the lagoon allows it to provide considerable storage of stormwater before discharging to the Pacific Ocean.

2.4.4 Land Use

Basin D has developed rapidly over the last few years with large residential projects. Residential land uses dominate the basin. Commercial facilities are located along Interstate 5 and local malls are scattered through out the basin. A total of 110 acres have been set aside in the basin for future industrial uses. The open space allocation is 32 percent of the basin and is located around the lagoon and tributaries.

2.4.5 Design Sensitivities

Potential environmental factors that must be considered during design process and must be negotiated, approved, or permits secured from the appropriate regulatory agency prior to construction within Basin D include, but are not limited to, the following:

- Coastal Development Permit from the California Coastal Commission
- Streambed Alteration Agreement from the California Department of Fish and Game
- Water Quality Certification from the Regional Water Quality Control Board
- Wetland Delineation Studies from the Army Corps of Engineers

2.5 Master Planned Facilities Under the PLDA Fee Program

The Planning Department maintains and updates the General Plan for City. The General Plan serves as a guide for public and private decision-makers regarding the future physical development of the City. The Drainage Master Plan is based in part on the land use and circulation elements of the General Plan. It provides a framework for preserving the City's unique character that ensures diversity, supports investment, and promotes change. Coupled with State of California government codes, statutory provisions, and municipal codes, the City has established impact fees under the Planned Local Drainage Area (PLDA) Fee Program to fund drainage master planned facilities.

2.5.1 Drainage Master Planned Improvements in Basin A

The drainage improvement projects described below have been identified to receive funding from the revised PLDA fee program for Basin A. The proposed project improvements identified below are shown on Figure 2-6.

2.5.1.1 Drainage Project AAA

Drainage Project AAA (Jefferson Street Drainage Project) has been proposed as a 36-inch RCP with a length of 550 linear feet (LF), four drainage inlets, and one manhole cleanout. The purpose of this facility is to collect onsite runoff from the residential areas north of Laguna Drive. The proposed Drainage Project AAA alignment begins just south of the intersection of Jefferson Street and Knowles Avenue. The collected runoff is expected to flow in a southerly direction, parallel to Jefferson Street, terminating at a junction structure at the corner of Jefferson Street and Laguna Drive. The junction structure connects the Project AAA alignment

to an existing 48-inch RCP. The proposed Drainage Project AAA will be installed using open trench construction techniques. Construction of the alignment would take place in the northbound lane of Jefferson Street. Trench boxes will be utilized to shore the side walls, thereby minimizing the disturbance to the existing roadway and conflicts with existing utility lines.

2.5.1.2 Drainage Project AAAA

Drainage Project AAAA (Madison Street Drainage Project) is proposed to consist of a 900-foot long, 24-inch RCP, three drainage inlets, two manhole cleanouts, and one junction structure. The purpose of the facility is to collect onsite runoff from the residential areas and to alleviate local ponding conditions between Arbuckle Place and Laguna Drive. The proposed alignment of Drainage Project AAAA begins at the intersection of Arbuckle Place and Madison Street. The alignment will parallel Madison Street such that the flow is in a northerly direction towards Laguna Drive. The project terminates at a proposed junction structure that connects to the existing 48-inch RCP on Laguna Drive. Open trench techniques could be used to construct the culvert where feasible and trench boxes could be used to minimize disturbance of existing roadway and to minimize conflicts with existing utilities.

2.5.1.3 Drainage Project AC

Drainage Project AC (Highland Drive Drainage Project) has been proposed in three parts, the upstream extension of a 36-inch RCP, the downstream construction of a trapezoidal channel, and the discharge outlet comprised of an 18-inch parallel pipe to the existing facility.

The upstream portion of the project is a 36-inch RCP pipe with a proposed length of 1,000 LF, six drainage inlets, and three manhole cleanouts. The purpose of this facility is to convey the onsite runoff from the residential areas surrounding Highland Drive and to extend the existing 36-inch RCP that has been built by others. The proposed AC alignment originates at the intersection of Highland Drive and Forest Avenue and runs parallel to and ends at Highland Drive.

The downstream portion of the project, an 8-foot x 1-foot deep concrete trapezoidal channel, will convey runoff for 600 feet into a natural desiltation basin is located in the southwest corner of Jefferson Street and Marron Road. Prior to the construction of the discharge outlet, sediment removal will be performed to restore the storage capacity of the natural settling basin. The discharge outlet will be an 18-inch RCP that will be constructed adjacent to an existing 18-inch facility that will convey the flow under Jefferson Street to Buena Vista Lagoon.

All pipes would be installed using open trench techniques where feasible. Construction of the alignment would take place in the northbound lane of Highland Drive and under Jefferson Street, utilizing trench boxes to minimize disturbance of existing roadway and conflicts with existing utilities.

2.5.1.4 Drainage Project AFA

Drainage Project AFA (Hidden Valley Drainage Restoration and Enhancement Project) is the proposed spot enhancement of a natural tributary to Buena Vista Creek. The existing natural tributary originates in open space, northeast of the intersection of Via Cristobal and Via Libertad and is adjacent to, and northwest of Hidden Valley Park. The natural tributary collects runoff from the open space, the park, residential areas and conveys runoff in a northerly direction for about 2,000 LF towards Buena Vista Creek. West of the tributary there is a utility corridor and a maintenance access road for aboveground power lines. The natural tributary has vegetated banks with minor erosion around its perimeter. However, within the confines of the conveyance there is sparse vegetation with minor to severe erosion. In addition, the conveyance crosses the maintenance access road. The proposed spot enhancement consists of a total of 3 gabion structures and side slope stabilization (approximately 300 feet) to minimize erosion and reduce runoff velocities within the tributary. The gabions will help reduce erosive velocities within the conveyance channel and aid in the

reduction of sediment transport. In addition, there will be the opportunity to promote native vegetation growth through the Gabion Structures.

The side slope stabilization may require the installation of a geo-textile fabric. If necessary, the proposed geo-textile fabric should be made of a durable synthetic fiber (nylon) that has sufficient void space (90 percent open area) that facilities root growth for existing vegetation or can be seeded. This geo-textile fabric system provides stabilization of side slopes while at the same time provides a support structure for vegetation to grow. Since this channel enhancement is adjacent to a maintenance access road, it will not require the construction of an adjacent temporary (12-foot) access road for construction equipment access. Maintenance of the gabion structures and periodic inspection of the geo-textile fabric support system can be performed on an as needed basis. Any areas of vegetation disturbance will be re-seeded at the end of the construction phase.

2.5.1.5 Drainage Project AFB

Drainage Project AFB (North Calavera Hills Drainage Restoration and Enhancement Project) is the proposed spot enhancement of a natural tributary to Buena Vista Creek. The existing natural tributary originates in open space, northeast of Carlsbad Village Drive and is west of Tamarack Avenue. The natural tributary collects runoff from the open space and the residential areas and conveys runoff in a northerly direction for about 3,600 LF where it confluences with Buena Vista Creek. The natural tributary has heavily vegetated banks with minor to severe erosion around its perimeter. In addition, within the confines of the conveyance there is sparse to dense vegetation with minor to severe erosion. The proposed spot enhancement consists of a total of 4 gabion structures and side slope stabilization (approximately 500 feet) to minimize erosion and reduce runoff velocities within the tributary. The gabions will help reduce erosive velocities within the conveyance channel and aid in the reduction of sediment transport. In addition, there will be the opportunity to promote native vegetation growth through the Gabion Structures.

The side slope stabilization may require the installation of a geo-textile fabric. If necessary, the proposed geo-textile fabric should be made of a durable synthetic fiber (nylon) that has sufficient void space (90 percent open area) that facilities root growth for existing vegetation or can be seeded. This geo-textile fabric system provides stabilization of side slopes while at the same time provides a support structure for vegetation to grow. The enhanced channel may require the construction of a temporary access road that will originate from future development. This will allow for construction equipment access, maintenance of the gabion structures and periodic inspection. The constructed footprint will be minimized to reduce the impact to surrounding vegetation, where feasible. Any areas of vegetation disturbance will be re-seeded at the end of the construction phase.

2.5.2 Drainage Master Planned Improvements in Basin B

The drainage improvement projects described below have been identified to receive funding from the revised PLDA Fee program for Basin B. The proposed project improvements identified below are shown on Figure 2-7.

2.5.2.1 Drainage Project B

Drainage Project B (Agua Hedionda Creek Dredging and Improvement Project) is the proposed channel improvements along a portion of Agua Hedionda Creek. The purpose of Drainage Project B is to dredge and widen portions of Agua Hedionda Creek at its confluence with Calavera Creek, improve conveyance capacity of the channel for containment of the 100-year flood event, collect onsite and offsite storm water runoff and to provide access at the downstream confluence that is within the Rancho Carlsbad residential community. Proposed channel dredging and widening improvements will extend for approximately 3,000 LF within the confines of the Rancho Carlsbad residential community. The proposed work will entail dredging and

widening, dewatering, disposal of sand and sediment from within the channel banks, bridge protection and onsite restoration where appropriate.

2.5.2.2 Drainage Project BB-1

Drainage Project BB-1 (Washington Street Drainage Improvement, Phase I) has been designed as an 18-inch RCP with a proposed length of 1,100 LF two drainage inlets, two manhole cleanouts and one junction structure. The purpose of the proposed facilities is to capture storm water runoff from behind the residential areas and help alleviate localized ponding in the surrounding areas. It is noted that there is a railroad right-of-way parallel and east of the proposed alignments. This 18-inch segment of proposed Drainage Project BB-1 will begin at the intersection of Pine Avenue and Washington Street and proceeds southeast parallel to the railroad tracks. The alignment will continue to Chestnut Avenue where it will turn east, proceeds under the railroad tracks and connects to an existing junction box for a 72-inch RCP. Open trench techniques will be used for construction of the culvert. Construction trenching will take into consideration the location of the railroad right-of-way. Trench boxes would be utilized to shore the sidewalls to minimize the disturbance of the railroad, adjacent properties and to minimize conflicts with existing utilities.

2.5.2.3 Drainage Project BB-2

Drainage Project BB-2 (Washington Street Drainage Improvement, Phase II) has been designed as a 36-inch RCP with a proposed length of 1,700 LF, three drainage inlets, two manhole cleanouts with one junction structure. This 36-inch segment of Drainage Project BB-2 will begin at Acacia Avenue, proceeds southeast parallel to the railroad tracks, and continue until it intersects Tamarack Avenue where it will turn east, proceed under the railroad tracks and connect to an existing junction box for an 84-inch RCP. Open trench techniques will be used for construction of the culvert. Construction trenching will take into consideration the location of the railroad right-of-way. Trench boxes would be utilized to shore the sidewalls to minimize the disturbance of the railroad, adjacent properties and to minimize conflicts with existing utilities.

2.5.2.4 Drainage Project BCA

Drainage Project BCA (Park Drive/Tamarack Avenue Drainage Project) has been designed as a 24-inch RCP with a proposed length of 2,900 LF, eight drainage inlets, nine manhole cleanouts and two junction structures. The purpose of this facility is to collect onsite drainage from the residential areas surrounding Park Drive and Tamarack Avenue to alleviate street ponding conditions from the general vicinity. The proposed Drainage Project BCA begins at the intersection of Sunnyhill Drive and Alder Avenue. The alignment travels northwest to the intersection of Monroe Street and Park Drive where is turns south on Park Drive. The alignment then travels south on Park Drive and then turns westward onto Tamarack Avenue, where the project terminates at a junction structure at the corner of James Drive and Tamarack Avenue. The junction structure connects the Project BCA alignment to an existing 48-inch RCP that flows in a southerly direction along James Street. The proposed work will take place in the eastbound lane of Monroe Street, the southbound lane of Park Drive and the westbound lane of Tamarack Avenue. Open trench construction techniques will be employed where feasible. Trench boxes would be utilized to shore the sidewalls to minimize disturbance of existing roadway and to minimize utility conflicts.

2.5.2.5 Drainage Project BCB

Drainage Project BCB (Magnolia Avenue Drainage Project) has been designed as a 30-inch RCP with a proposed length of 925 LF, four drainage inlets and three manhole cleanouts. The purpose of the facility is to drain low areas of Valley Street, Magnolia Avenue and collect the runoff from the local residential areas. The proposed facility will begin at the intersection of Magnolia Avenue and Valley Street, proceed in a southwest direction along Magnolia Avenue, where it will terminate at a junction structure that is connected to an existing 48-inch RCP. The junction structure will be at the corner of Brady Circle and Magnolia Avenue.

Work will take place in the eastbound portion of Magnolia Avenue where open trench construction methods will be used where feasible. Trench boxes would be utilized to shore the sidewalls to minimize the disturbance of the existing roadway and to minimize conflicts with existing utilities.

2.5.2.6 Drainage Project BCC

Drainage Project BCC (Chestnut Avenue Drainage Project) has been designed as a 36-inch RCP with a proposed length of 925 LF, four drainage inlets and three manhole cleanouts. The purpose of the facility is to reduce flooding that occurs on portion of Chestnut Avenue during storm events and to collect onsite runoff from surrounding residential areas. The proposed Drainage Project BCC begins at the intersection of Chestnut Avenue and Valley Street. The alignment runs in a southwest direction along Chestnut Avenue and terminates at a junction structure that connects to an existing 42-inch RCP. The junction structure is located approximately 400 LF east of the intersection of Highland Drive and Chestnut Avenue. Construction work will take place in the eastbound portion of Chestnut Avenue using open trench construction methods where feasible. Trench boxes would be utilized to shore the sidewalls to minimize the disturbance of the existing roadway and to minimize conflicts with existing utilities.

2.5.2.7 Drainage Project BFA

Drainage Project BFA (Country Store Storm Drain Project) has been design as a 42-inch RCP with a proposed length of 1,600 LF, nine drainage inlets and five manhole cleanouts. The purpose of the facility is to collect onsite runoff from the residential and adjacent areas on the south side of El Camino Real, to drain stormwater runoff from south of El Camino Real and convey it westward towards the existing earthen channel that originates from the sedimentation basin BF1and travels southerly to open space. The proposed Drainage Project BFA begins 200 LF west of the intersection of Lisa Street and El Camino Real. It follows the alignment of El Camino Real and terminates 200 LF east of the intersection of Kelly Drive and El Camino Real. The project will be constructed using open trench techniques south of El Camino Real. In locations were construction will take place in the eastbound lanes of El Camino Real, trench boxes would be utilized to shore the sidewalls to minimize the disturbance of the existing roadway and to minimize conflicts with existing utilities.

2.5.2.8 Drainage Project BFB-U

Drainage Project BFB-U (El Camino Real Drainage Project, Phase I) has been designed as a naturally enhanced trapezoidal (2' x 3') channel with 2:1 side slopes. The upstream portion, a natural tributary originates 1,500 feet south of Chestnut Avenue, and extends for approximately 3,000 feet along the east side of the El Camino Real right-of-way where it passes beneath Tamarack Avenue and then extends another 800 feet to the existing box culvert under El Camino Real. The natural tributary has sparse to heavily vegetated banks with minor to severe erosion around its perimeter. In addition, within the confines of the conveyance there is sparse to dense vegetation with minor to severe erosion. The proposed enhancement consists of gabion structures and side slope stabilization to minimize erosion. The gabions will help reduce erosive velocities within the conveyance channel and aid in the reduction of sediment transport towards the Agua Hedionda Creek. In addition, there will be the opportunity to promote native vegetation growth through the Gabion Structures.

The side slope stabilization will require the installation of a geo-textile fabric. The proposed geo-textile fabric is made of a durable synthetic fiber (nylon) that has sufficient void space (90 percent open area) that facilitates root growth for existing vegetation, or can be seeded. This geo-textile fabric system provides stabilization of side slopes while at the same time provides a support structure for vegetation to grow. Any areas of vegetation disturbance will be re-seeded at the end of the construction phase.

2.5.2.9 Drainage Project BFB-L

Drainage Project BFB-L (El Camino Real Drainage Project, Phase II) has been designed as a 48-inch RCP. The lower portion begins at the intersection of Tamarack Avenue and El Camino Real and conveys the runoff in a southerly direction towards the temporary sedimentation basin (Basin BF1). The 48-inch RCP has a proposed length of 800 LF, three drainage inlets and one junction structure. The purpose of the facility will be to convey runoff that is collected from the existing drainage facilities that run southerly along El Camino Real. Construction of Drainage Project BFB-L will take place in the northeast side of El Camino Real where open trench construction methods will be used in the open area. In locations were construction will take place in the lanes of El Camino Real, trench boxes would be utilized to shore the sidewalls to minimize the disturbance of the existing roadway and to minimize conflicts with existing utilities.

2.5.2.10 Drainage Project BF1

Drainage Project BF1 (Kelly Drive Water Quality Basin Project) is a proposed sedimentation basin downstream of Drainage Project BFB-L. The purpose of the facility is to control onsite and channel runoff, reduce the amount of sediment transport within the flow of the natural tributary and serve as a water quality treatment facility. The proposed location of Drainage Project BF1 will be northeast of the intersection of Kelly Drive and El Camino Real where the runoff will settle prior to discharge. The sedimentation basin will be designed to treat the first flush and low flows of storm events and will accommodate the runoff from Drainage Project BFB and upstream natural tributaries. The basin will incorporate an entrance weir with a bypass structure to minimize overtopping during heavy rainfall events and an exit weir to meter the runoff at the outfall. In addition, vegetative enhancements will be incorporated along the perimeter and within the confines of the basin where feasible. The sedimentation basin will be designed to mitigate (infiltrate, filter, or treat) the volume of runoff produced from a 24-hour 85th percentile storm event, or the maximum flow rate of runoff produced from a rainfall intensity of 0.2 inch of rainfall per hour for each hour of a storm event.

2.5.2.11 Drainage Project BJ-1

Drainage Project BJ-1 (Rancho Carlsbad Retention Basin Project) is a proposed retention basin and a Reinforced Concrete Box culvert outlet that discharges to an existing tributary. The retention basin will be located in the southeast corner of College Boulevard and Cannon Road. The proposed extension of College Boulevard and its required fill will act as an embankment of the basin to contain the expected volume of runoff. The basin will occupy eight acres of land and will be designed to contain 49 acre-feet of water during a 100-year storm event. The basin will convey its runoff through a 3-foot x 6-foot reinforced concrete box culvert that will be funded in two parts. The first 270 feet of construction (to be funded by the City) will extend under College Boulevard in westerly direction. An additional extension of 90 feet (to be funded by others) will provide a crossing to access additional parcels of land. The total length of the reinforced concrete box culvert will be 360 feet and will extend to an existing earthen channel.

2.5.2.12 Drainage Project BJB

Drainage Project BJB (College Boulevard Sedimentation Basin Structural Improvements Project) is the proposed modification of the outflow structure at sedimentation basin BJB, and the modification to the inflow structure to the Calavera Creek. The Sedimentation Basin BJB is located in the northeast corner of Cannon Road and College Boulevard. The basin has an outflow structure that is part of a drainage system that conveys runoff under College Boulevard and Cannon Road and discharges to an inflow structure at Calavera Creek. Modification to both structures is required for the purpose of metering flow, reducing velocity and potential scour and overall improvement of the conveyance.

2.5.2.13 Drainage Project BL-U

The original Drainage Project BL (College Boulevard Drainage Project) has been designed and built in several stages. One of the remaining project components currently in design is the Drainage Project BL-U (College Boulevard Drainage Project, Phase IV) (Upstream Portion). The Drainage Project BL-U (Upstream Portion) has been designed as a 39-inch RCP with a proposed length of 800 LF, four drainage inlets, one manhole cleanout and two junction structures. The purpose of Drainage Project BL-U (Upstream Portion) is to provide drainage for future development east of Salk Avenue. The project begins 800 feet from the end of Salk Avenue and conveys runoff in a westerly direction to an existing RCP pipe. Drainage Project BL-U (Upstream Portion) will connect to the existing drainage facilities that convey storm water runoff along College Boulevard to Agua Hedionda Creek. The project will be constructed using open trench techniques east of Fermi Court, as well as, south of Salk Avenue. Trench boxes would be utilized to shore the sidewalls to minimize the disturbance of the existing roadway and to minimize conflicts with existing utilities.

2.5.2.14 Drainage Project BL-L

The original Drainage Project BL (College Boulevard Drainage Project) has been designed and built in several stages. One of the remaining project components currently in design is the Drainage Project BL-L (College Boulevard Drainage Project, Phase V) (Downstream Portion). The Drainage Project BL-L (Downstream Portion) has been designed as a 90-inch RCP with a proposed length of 20 LF, one junction structure and an outlet headwall. The proposed 90-inch RCP will tie into an existing 78-inch RCP and provide additional capacity for future development. The outlet headwall structure of the 90-inch RCP is configured to pass through a new bridge abutment. The purpose of Drainage Project BL-L (Downstream Portion) is to provide additional capacity to convey runoff to Agua Hedionda Creek with an outlet structure configured to fit into the proposed bridge construction. The proposed Agua Hedionda Creek bridge over College Boulevard will consist of two 125-foot long by 40-foot wide clear-span structures with concrete abutments. The Drainage Project BL-L (Downstream Portions) will be located on College Boulevard at Agua Hedionda Creek. The project will be constructed using sheet pilling, open trench techniques, as well as, trench boxes to shore the sidewalls to minimize the disturbance of the existing roadway and to minimize conflicts with existing utilities.

2.5.2.15 Drainage Project BM

Drainage Project BM (Cantarini Box Culvert Project) has been designed as a 260-foot long, 5-foot x 32-inch reinforced concrete box culvert that extends under the intersection of two local streets that will be constructed as part of the Cantarini Development. The project will include inlet/outlet headwalls and rock slope protection for velocity dissipation. The culvert is located in an unnamed tributary to Agua Hedionda Creek, east of College Boulevard.

2.5.2.16 Drainage Project BN

Drainage Project BN (Calavera Creek Flood Control Improvement, Phase I) has been designed as a two phase project. The first phase of the improvements provides downstream enhancement to the Calavera Creek. The Calavera Creek project starts at the outlet of a box culvert under the intersection of College Boulevard and Cannon Road. The discharge from the box culvert is metered by an existing weir wall (phase two of the project). This discharge is then conveyed by the existing tributary (Calavera Creek) for about 3,200 LF along the perimeter of the Rancho Carlsbad residential community. The existing tributary (Drainage Project BN) conveys runoff in a southwesterly direction to its ultimate confluence with Agua Hedionda Creek, northeast of the El Camino Real Bridge crossing. Additional modifications include installation of gabion structures, removal of miscellaneous concrete, and bank stabilization along the creek to prevent erosion.

2.5.2.17 Drainage Project BNB

Drainage Project BNB (Calavera Creek Flood Control Improvement, Phase II) has been designed as an 84-inch RCP (Parallel Facility) that runs parallel to Calavera Creek on the north side of the Cannon Road alignment. The Parallel Facility is proposed as an 84-inch RCP with a proposed length of 3,600 LF, a structural connection to an existing box culvert, nine special (large diameter) cleanouts, one wingwall with apron, and rock slope protection for velocity dissipation. The purpose of the facility is to convey runoff (collected in Basin BJB) in a southerly direction towards Agua Hedionda Creek and to reduce the volume of flow in Calavera Creek. The proposed construction begins at the existing box culvert located at the intersection of College Boulevard and Cannon Road and conveys runoff in a southwesterly direction. It follows the alignment of Cannon Road and discharges into open space at Agua Hedionda Creek, northeast of the intersection of Cannon Road and El Camino Real. The project will be constructed using open trench techniques north of Cannon Road. In locations were construction will take place in the westbound lanes of Cannon Road, trench boxes would be utilized to shore the sidewalls to minimize the disturbance of the existing roadway and to minimize conflicts with existing utilities. Additional modifications include the reconstruction and removal of existing weir wall on the northwest portion of Calavera Creek.

2.5.2.18 Drainage Project BP

Drainage Project BP (Melrose Drainage Project) is a proposed culvert which will route runoff from a basin, underneath Faraday Avenue. The flow will drain through a proposed 28 foot long, 4.3-foot x 5.7-foot reinforced concrete box that ties into an existing 172-foot, 6-foot x 7-foot reinforced concrete box culvert that discharges to a rip-rap field that connects to an existing natural drainage course. Vegetative enhancements will be incorporated along the perimeter and within the confines of the basin where feasible.

2.5.2.19 Drainage Project BQ

Drainage Project BQ (Sunny Creek Road Restoration and Enhancement Project) is the proposed spot enhancement of a natural tributary that conveys runoff from an open area and the Squires Dam. The natural tributary originates on the west side of the Squires Dam just east of Sunny Creek Road and conveys runoff in a southwesterly direction for about 800 LF towards Agua Hedionda Creek. The natural tributary has sparse to heavily vegetated banks with minor to severe erosion around its perimeter. In addition, within the confines of the conveyance there is sparse to dense vegetation with minor to severe erosion. The proposed spot enhancement consists of a total of 3 gabion structures and side slope stabilization to minimize erosion and reduce runoff velocities within the tributary. The gabions will help reduce erosive velocities within the conveyance channel and aid in the reduction of sediment transport towards the Agua Hedionda Creek. In addition, there will be the opportunity to promote native vegetation growth through the Gabion Structures.

The side slope stabilization may require the installation of a geo-textile fabric. If necessary, the proposed geo-textile fabric should be made of a durable synthetic fiber (nylon) that has sufficient void space (90 percent open area) that facilitates root growth for existing vegetation, or can be seeded. This geo-textile fabric system provides stabilization of side slopes while at the same time provides a support structure for vegetation to grow. In addition, the enhanced channel will require the construction of an adjacent temporary (15-foot) access road for site entry, allow for construction equipment access, temporary maintenance of the gabion structures and periodic inspection. The temporary access road will originate from future development and the constructed footprint will be minimized to reduce the impact to surrounding vegetation, where feasible. Any areas of vegetation disturbance will be re-seeded at the end of the construction phase.

2.5.2.20 Drainage Project BR

Drainage Project BR (Cantarini and Holly Springs Development) has been designed as a 66-inch culvert with a proposed length of 155-linear feet that runs under College Boulevard, north of Sunny Creek Road and the

BL-L bridge. The project will incorporate an inlet headwall, as well as an impact dissipater and rock slope protection at the outlet for velocity dissipation. The project will be constructed using open trench techniques. Trench boxes would be utilized to shore the sidewalls to minimize the disturbance of the existing roadway and to minimize conflicts with existing utilities.

2.5.3 Drainage Master Planned Improvements in Basin C

The drainage improvement projects described below have been identified to receive funding from the revised PLDA Fee program for Basin C. The proposed project improvements identified below are shown in Figure 2-8.

2.5.3.1 Drainage Project C1

Drainage Project C1 (Carlsbad Boulevard South Drainage Improvements) has been proposed as two 100-foot long by 40-foot wide clear-span structures with concrete abutments. Runoff from Encinas Creek would flow underneath in a westerly direction towards the Pacific Ocean. This project would allow for capacity in Encinas Creek to accommodate a 100-year peak flow. The project will be constructed using sheet pilling, open trench techniques, as well as trench boxes to shore sidewalls, and would be monitored closely to minimize impacts to the existing roadway, utilities, and channel habitat.

2.5.3.2 Drainage Project C2

Drainage Project C2 (Paseo Del Norte Drainage Improvements) has been designed to provide an additional 10-foot by 4-foot Reinforced Concrete Box culvert with a proposed length of 90 LF. The purpose of the proposed improvement is to provide additional capacity to the existing bridge that conveys the Encinas Creek flow beneath the lanes of Paseo Del Norte. The proposed box culvert will accommodate and convey the runoff from the contributing area of the Encinas basin east of Paseo Del Norte and will also help alleviate localized flooding from the Encinas Creek. The proposed box culvert is oriented in an east-west direction and will convey the storm water runoff from the Encinas Creek in a westerly direction adjacent to an industrial area. Open trench construction techniques will be employed where feasible. Trench boxes would be utilized to shore the sidewalls to minimize disturbance of the existing roadway and to minimize conflicts with existing utilities.

2.5.3.3 Drainage Project CA

Drainage Project CA (Avenida Encinas Drainage Improvements) has been designed as a concrete trapezoidal channel with a proposed length of 600 LF. The purpose of the proposed improvement to this unlined tributary is to provide a drainage outlet that will convey runoff from an open area that is slated for development and will also help alleviate localized flooding and runoff as well as mitigate for erosion from the adjacent railroad right-of-way (AT & SF) west of the project. It is noted that the railroad right-of-way west of the proposed alignment is utilized by the Coaster. In addition, there is a train station south of the proposed improvement. The proposed trapezoidal channel will begin 400 feet north of the Poinsettia Lane Commuter Rail Station and travels in a northerly direction along the west side of the track to the southern end of an existing concrete channel. The railroad right-of-way is between Avenida Encinas and Franciscan Road. The proposed channel will collect localized runoff and conveys it to the Encinas Creek. Open trench construction techniques will be employed where feasible. Trench boxes would be utilized to shore the sidewalls to minimize disturbance of the existing railroad right-of-way, the roadway and to minimize conflicts with existing utilities.

2.5.4 Drainage Master Planned Improvements in Basin D

The drainage improvement projects described below have been identified to receive funding from the revised PLDA Fee program for Basin D. The proposed project improvements identified below are shown in Figure 2-9.

2.5.4.1 Drainage Project DBA

Drainage Project DBA (Poinsettia Village Drainage Improvements) has been designed as a 30-inch RCP with a proposed length of 360 LF, two manhole cleanouts and two junction structures. The purpose of this facility is to connect an existing 24-inch RCP within the residential area (southeast quadrant of the I-5/Poinsettia Lane junction) that crosses under I-5 and drains towards the Poinsettia Village Mall for a connection to an existing 36-inch RCP, completing the drainage system network. The proposed project will connect the existing 24-inch RCP via the proposed 30-inch RCP, to the 36-inch RCP minimizing potential flooding between the adjacent southbound on-ramp to I-5 and the Poinsettia Village Mall. The proposed Drainage Project DBA will follow the alignment of the access ramp, just west of the right-of-way, conveying runoff in a northwesterly direction, and will terminate at a junction structure with the existing 36-inch RCP. Construction will take place west of the right-of way access ramp. Open trench construction techniques will be employed where feasible. Trench boxes will be utilized to shore the side walls to minimize the disturbance of the existing roadway and to minimize conflicts with existing utilities.

2.5.4.2 Drainage Project DBB

Drainage Project DBB (Avenida Encinas Drainage Improvements) has been designed as a 30-inch RCP with a proposed length of 720 LF, three manhole cleanouts and one junction structure. The purpose of this facility is to convey the residential and commercial runoff from Avenida Encinas to minimize localized street ponding, and to extend the existing 30-inch RCP that runs to an existing 60-inch RCP at the intersection of Avenida Encinas and Loganberry Drive (Poinsettia Village Mall). The proposed Drainage Project DBB will follow the alignment of Avenida Encinas conveying runoff in a northwesterly direction, and will terminate at a junction structure with the existing 60-inch RCP. Construction will take place in the westbound lane of Avenida Encinas. Open trench construction techniques will be employed where feasible. Trench boxes will be utilized to shore the side walls to minimize the disturbance of the existing roadway and to minimize conflicts with existing utilities.

2.5.4.3 Drainage Project DFA

Project DFA (Batiquitos Lagoon Stormwater Treatment System Project) is a proposed concrete treatment device that will settle out constituents and discharge runoff directly into Batiquitos Lagoon. The proposed treatment device is fed by the existing Drainage Project DF, a 72-inch RCP. The purpose of the facility is to control onsite and culvert runoff, reduce the amount of sediment transport and constituents of concern within the flow of the tributary and to reduce the velocity of the flow, thus minimizing the erosion potential downstream of the basin. The proposed location of Drainage Project DFA will be southwest of the intersection of Arenal Road and El Camino Real where the constituents within the runoff will settle prior to discharge into the Batiquitos Lagoon. The treatment device will accommodate residential runoff from north of the project, incorporate an internal weir with a bypass structure to minimize overtopping or backing up of the drainage system during heavy rainfall events, an exit culvert to meter the runoff, and rock slope protection to reduce velocity at the outfall. In addition, vegetative enhancements will be incorporated along the perimeter of the treatment device where feasible.

2.5.4.4 Drainage Project DH

Project DH (Altiva Place Canyon Restoration and Enhancement Project) is the proposed spot enhancement of a natural channel that conveys runoff from the residential areas south of Alga Road and adjacent open areas. The proposed spot improvements of the natural channel will originate south of the intersection of Alga Road and Paseo Candelero. The alignment will convey runoff in a southwesterly direction for about 3,111 LF towards the intersection of Alicante Road and Altiva Place. The natural tributary has sparse to heavily vegetated banks with minor to severe erosion around its perimeter. In addition, within the confines of the conveyance there is sparse to dense vegetation with minor to severe erosion. The proposed spot enhancement consists of a total of 6 gabion structures and side slope stabilization to minimize erosion and reduce runoff velocities within the tributary. The gabions will help reduce erosive velocities within the conveyance channel and aid in the reduction of sediment transport. In addition, there will be the opportunity to promote native vegetation growth through the Gabion Structures.

The side slope stabilization may require the installation of a geo-textile fabric. If necessary, the proposed geo-textile fabric should be made of a durable synthetic fiber (nylon) that has sufficient void space (90 percent open area) that facilitates root growth for existing vegetation, or can be seeded. This geo-textile fabric system provides stabilization of side slopes while at the same time provides a support structure for vegetation to grow. In addition, the enhanced channel will require the construction of an adjacent temporary (10-foot) access road for site entry, allow for construction equipment access, temporary maintenance of the gabion structures and periodic inspection. The temporary access road will originate from future development and the constructed footprint will be minimized to reduce the impact to surrounding vegetation, where feasible. Any areas of vegetation disturbance will be re-seeded at the end of the construction phase.

2.5.4.5 Drainage Project DQB

Drainage Project DQB (La Costa Town Center Drainage Improvements Project) has been designed as a 36-inch RCP with a proposed length of 2,500 LF, five manhole cleanouts and one junction structure. The purpose of this facility is to convey commercial runoff from the proposed La Costa Town Center. The proposed Drainage Project DQB will follow the alignment of Rancho Santa Fe Road, conveying runoff in a southwesterly direction. This will discharge to the upper reaches of facility DQC. After 1000 feet, it will turn south and end in an existing natural drainage course just south of La Costa Avenue. Open trench construction techniques will be employed where feasible. Trench boxes will be utilized to shore the side walls to minimize the disturbance of the existing roadway and to minimize conflicts with existing utilities.

2.5.4.6 Drainage Project DZ

Drainage Project DZ (Poinsettia Lane Drainage Improvements) is proposed as two 10-foot by 12-foot Reinforced Concrete Box culverts with a length of 100 linear feet (L.F.). The purpose of this facility is to provide unhampered flow of an existing natural tributary that would convey runoff under Poinsettia Lane and towards Batiquitos Lagoon. The crossings would permit the extension of Poinsettia Lane to be completed between Cassia Road and Skimmer Court. The proposed Drainage Project DZ will be located just west of Skimmer Court on Poinsettia Lane. The box culverts will be oriented in a southwesterly direction and will allow runoff to pass underneath Poinsettia Lane in a southwesterly direction. It is noted that this project will have budgetary constraints, and partial funding may have to be secured from other sources. Open trench construction techniques will be employed to minimize impacts to the motoring public right-of-way.

2.6 Non-PLDA Projects

The City of Carlsbad maintains and operates a vast number of drainage facilities. As described in Chapter 1.1.2-Carlsbad Drainage Infrastructure, these facilities vary in age and in composition. Due to their continuous use, many of the facilities deteriorate over time, become clogged with sediment or debris, need

replacement because they have exceeded their expected service life, or fail due to corrosion or scour. The City of Carlsbad performs continuous rehabilitation, restorations and repairs that include a broad range of work such as emergency repairs and channel maintenance or improvements.

The following existing drainage facilities have been identified as requiring continuous maintenance or future improvement. Because the statutes that govern the PLDA fee structure preclude operation and maintenance programs from funding, these projects must receive funding through another source. They have been included in this DMP Update to facilitate the environmental process related to each project. By mention in the PEIR, environmental impact assessment and permitting becomes less arduous and more systematic. Figure 2-10 displays Non-PLDA projects.

2.6.1 Rehabilitation, Restorations, Repairs or Improvements in Basin A

There is no Non-PLDA-related drainage facility in Basin A that requires continuous maintenance or future improvement.

2.6.2 Rehabilitation, Restorations, Repairs or Improvements in Basin B

Basin B has the drainage facilities identified below as requiring continuous maintenance or future improvement.

2.6.2.1 Maintenance Project B and BN

Dredging of the Agua Hedionda Creek will be covered under the PLDA fee program. Upon completion of channel dredging improvements, long term maintenance of Agua Hedionda and Calavera Creeks will be required to meet flood control needs (i.e. contain the 100-year flood events). The long term maintenance of the channels will include periodic inspections, sediment, debris and vegetation removal, and repair of eroded surfaces associated with drainage and bridge appurtenances.

2.6.2.2 Maintenance Project BAA

Drainage Project BAA involves the maintenance of a natural channel that begins at the outlet of a 51-inch RCP north of the Encina Power Plant property, and flows northwesterly before discharging into Agua Hedionda Creek.

2.6.2.3 Maintenance Project BE

This project involves the maintenance of a natural channel that begins at the outlet of a detention basin (located south of Van Allen Way) and flows through the City Golf Course and Veteran Memorial Park.

2.6.2.4 Maintenance Project BEA

This project involves the maintenance of a natural channel that begins in the open area, located northeast of Faraday Avenue, and flows southwesterly before discharging into Facility BE.

2.6.2.5 Maintenance Project BJ-2

This project involves the periodic maintenance and sediment removal to maintain the original line and grade to ensure operational efficiency. The long term maintenance of the basin will include periodic inspections, dewatering, sediment, debris and vegetation removal, and repair of eroded surfaces associated with drainage inlet and outlet structures.

2.6.2.6 Maintenance Project BL-L

Bridge construction at Agua Hedionda Creek has not been completed. Once completed, the tributary is expected to convey a significant amount of sand and sediment that will have to be removed and maintained to allow the bridge to pass the design 100-year flood event. In addition, environmental permits or mitigation may be required to maintain the channel.

2.6.3 Rehabilitation, Restorations, Repairs or Improvements in Basin C

Basin C contains the drainage facilities identified below as requiring continuous maintenance or future improvement.

2.6.3.1 Maintenance Project C

Project C provides for general maintenance within City property along the corridor of Encinas Creek. The Encinas Creek currently flows from the southwest corner of Palomar Airport Road and El Camino Real towards the Pacific Ocean through private and City properties. Although the property owners provide the improvements, enhancements and general maintenance along the privately owned portions of the creek there will be a need for additional channel dredging and long term maintenance agreements along Encinas Creek to meet flood control needs (i.e. contain the 100-year flood events). Long term maintenance includes periodic inspections, dewatering, sediment, debris and vegetation removal, and repair of eroded surfaces associated with drainage and bridge appurtenances.

2.6.4 Rehabilitation, Restorations, Repairs or Improvements in Basin D

Basin D includes the following drainage facilities identified below as requiring continuous maintenance or future improvement.

2.6.4.1 Maintenance Project DFA

Project DFA is a sedimentation/water quality basin that will require sediment removal to maintain the original line and grade and ensure operational efficiency. The long term maintenance of the basin will include periodic inspections, dewatering, sediment, debris and vegetation removal, and repair of eroded surfaces associated with drainage inlet and outlet structures. This project is located northwest of the intersection of La Costa Avenue and El Camino Real.

2.6.4.2 Maintenance Project DM

Project DM is an unnamed natural channel that is subject to erosive velocities during storm events. The project is located between Poinsettia Lane and Alga Road, on the west side of Almaden Lane. Erosion and sediment transport may result in deposition of solids downstream of the conveyance. Stabilization or continuous maintenance will be required. (See Figure 2-10).

2.7 Capital Improvement Projects (CIP)

The Capital Improvement Program (CIP) provides a framework for prioritizing and funding the construction of public facilities based on the City's projected Build-Out condition. The City Planning Department actively monitors development activity to assure compliance with the Growth Management Plan and to ensure that all necessary support facilities are being constructed as development progresses. The CIP details the arrangement

of projects in sequential order based on a schedule of priorities and assigns an estimated cost and anticipated method of funding for each individual project. Funding for these CIP projects may come from a variety of funding sources as provided by the City. Individual projects are evaluated on an annual basis and projects that are necessary to meet growth management performance standards are considered to be of highest priority and therefore scheduled first. The CIP provides the financial foundation necessary to move forward with the construction of needed public facility improvements.

The following chapter will describe individual CIP projects, their respective locations and purpose for construction. In addition, large CIP programs may be broken into component projects due to funding requirements. The City of Carlsbad has identified a typical program called "Miscellaneous Road Subdrains (Project Number 3681)" that has been broken up and is identified throughout the CIP program in its components parts within the appropriate basin.

The following drainage facility projects have been identified in the 2006-2007 CIP. Figure 2-10 displays these CIP projects. These projects are not programmed to receive funding from the PLDA Fee program.

2.7.1 Capital Improvement Program Projects in Basin A

Basin A has the drainage facilities identified below as part of the CIP.

2.7.1.1 CIP Project A-CIP-1

Project A-CIP-1 is included in the Miscellaneous Road Subdrains Project (Project Number 3681). Project A-CIP-1 encompasses storm drains located at Linda Lane that are experiencing surface/subsurface drainage problems. The storm drains sites will be investigated and solutions recommended.

2.7.1.2 CIP Project A-CIP-2

Project A-CIP-2 (Cynthia Lane Storm Drain Project) is located at the western end of Cynthia Lane near Interstate 5 and consists of replacing the existing 18-inch CMP with a 24-inch RCP.

2.7.1.3 CIP Project A-CIP-3

Project A-CIP-3 (Carlsbad Boulevard Storm Drain Replacement Project) is located between Carlsbad Boulevard and the San Diego Northern Railroad tracks just south of where the railroad tracks cross Carlsbad Boulevard. A total of 350 LF of the current 18-inch CMP will be replaced with an 18-inch RCP pipe. Additional drainage inlets will be provided with the replacement.

2.7.1.4 CIP Project A-CIP-4

Project A-CIP-4 (Ridgecrest Drainage Improvements Project) is located on Ridgecrest Drive. The existing inlet at the low point of the road clogs during storm events. The inlet is being replaced as well as 130 LF of 18-inch CMP. The pipe is being replaced by an 18-inch RCP pipe.

2.7.2 Capital Improvement Program Projects in Basin B

Basin B has the drainage facilities identified below as part of the CIP.

2.7.2.1 CIP Project B-CIP-1

Project B-CIP-1 is included in the Miscellaneous Road Subdrains Project (Project Number 3681). Project B-CIP-1 is located at Calavo Court. The storm drains at this location are experiencing surface/subsurface drainage problems. The site will be investigated and solutions recommended.

2.7.2.2 CIP Project B-CIP-2

Project B-CIP-2 is included in the Miscellaneous Road Subdrains Project (Project Number 3681). Project B-CIP-2 is located at Park Drive and Cove Drive. The storm drains at this location are experiencing surface/subsurface drainage problems. The site will be investigated and solutions recommended.

2.7.2.3 CIP Project B-CIP-3

Project B-CIP-3 (Highland Drive Drainage Improvements Project) is located on the west side of Highland Drive, between Pine Avenue and Basswood Avenue. The specific alignment will be determined after further study. The general location of the new 18-inch RCP will be along Highland Drive from a mid-block low point into an existing drainage channel on either side of Pine Avenue or Basswood Avenue.

2.7.2.4 CIP Project B-CIP-4

Project B-CIP-3 (Kelly Drive Drainage Improvements) is located parallel to Kelly Drive, east of Hillside Drive. It will be located behind a row of homes on the south side of Kelly Drive. The project involves the reconstruction of 260 LF of an existing concrete lined trapezoidal channel. The channel has a bottom width of 5.5 feet, side slopes of 1.5, a depth of 6.5 feet, and a top width of 25 feet. In addition, 780 LF of concrete slope protection will be added. The existing concrete channel is breaking apart. In at least one section the concrete lining has been destroyed and the underlying earth is being eroded.

2.7.3 Capital Improvement Program Projects in Basin C

Basin C currently has no facilities included in the 2006-2007 CIP.

2.7.4 Capital Improvement Program Projects in Basin D

Basin D has the drainage facilities identified below as part of the CIP.

2.7.4.1 CIP Project D-CIP-1

Project D-CIP-1 is included in the Miscellaneous Road Subdrains Project (Project Number 3681). Project D-CIP-1 is located at Carlina Street and Hataca Road. The storm drains at this location are experiencing surface/subsurface drainage problems. The site will be investigated and solutions recommended.

2.7.4.2 CIP Project D-CIP-2

Project D-CIP-2 is included in the Miscellaneous Road Subdrains Project (Project Number 3681). Project D-CIP-2 is located at Alicante Road and Corte De La Vista. The storm drains at this location are experiencing surface/subsurface drainage problems. The site will be investigated and solutions recommended.

2.7.4.3 CIP Project D-CIP-3

Project D-CIP-3 is included in the Miscellaneous Road Subdrains Project (Project Number 3681). Project D-CIP-3 is located at La Costa Avenue and Cadencia Street. The storm drains at this location are experiencing surface/subsurface drainage problems. The site will be investigated and solutions recommended.

2.7.4.4 CIP Project D-CIP-4

Project D-CIP-4 is included in the Miscellaneous Road Subdrains Project (Project Number 3681). Project D-CIP-4 is located at Quebrada Circle. The storm drains at this location are experiencing surface/subsurface drainage problems. The site will be investigated and solutions recommended.

2.7.4.5 CIP Project D-CIP-5

Project D-CIP-5 is included in the Miscellaneous Road Subdrains Project (Project Number 3681). Project D-CIP-5 is located at Avenida Nieve. The storm drains at this location are experiencing surface/subsurface drainage problems. The site will be investigated and solutions recommended.

2.7.4.6 CIP Project D-CIP-6

Project D-CIP-6 is included in the Miscellaneous Road Subdrains Project (Project Number 3681). Project D-CIP-6 is located at Circulo Adorno. The storm drains at this location are experiencing surface/subsurface drainage problems. The site will be investigated and solutions recommended.

2.7.4.7 CIP Project D-CIP-7

Project D-CIP-7 (La Costa Avenue Storm Drain Replacement Project) is located along La Costa Avenue between El Camino Real and Viejo Castilla Way. Old corrugated metal storm drains will be replaced with reinforced concrete pipe at various locations along La Costa Avenue. The existing CMP storm drains are in very poor condition and need to be replaced.

2.7.4.8 CIP Project D-CIP-8

Project D-CIP-8 (Gabbiano Lane Storm Drain Modification) is located south of Gabbiano Lane near Batiquitos Lagoon. An existing storm drain outlet will be studied to determine a revised configuration that will enable the adjacent private desiltation basin to drain entirely. The project will reduce the maintenance costs for private and public facilities associated with the storm drain outlet.

2.7.4.9 CIP Project D-CIP-9

Project D-CIP-9 (Calle Gavanzo Subsurface Drainage Improvements) is located on the west side of Calle Gavanzo. The west portion of the road is continually wet, exhibiting signs of subsurface drainage problems. Visual observations indicate that the pavement is slowly separating from the gutter. The eastside of the street does not experience similar problems since subsurface drains were installed on that side of the street. An 8-inch PVC slotted pipe will be installed to alleviate the problem.

2.7.4.10 CIP Project D-CIP-10

Project D-CIP-10 (Romeria Drainage Improvements Project) is located behind private properties along Romeria Street. About 400 LF of a trapezoidal concrete channel will be replaced as well as 200 LF of tributary ditches. A hydrology and hydraulics study will be needed to verify the channel size and adequacy of the culvert under La Costa Avenue. The channel is estimated to be 2 feet wide and 4 feet tall with 2 to 1 (width to height) side slopes. The existing channel is badly damaged with various sink holes. The project will improve drainage capacity and conveyance as well as prevent undermining of the facility.

2.8 Operations and Maintenance Activities

The City of Carlsbad Public Works Department is responsible for a variety of services that keep all public infrastructure functioning properly. The department performs a broad range of activities that can encompass sediment removal (by manual or mechanical means) that may include, but not be limited to, infrastructure replacement. City forces conduct periodic inspections as part of their Operations and Maintenance activities associated with supporting the existing City infrastructure. In addition, the City also maintains a hot line for emergency repair, tracks phone calls from the general public when localized flooding occurs, and performs needed repairs or clean up. Some of the activities have specific frequencies while others are on an as-needed basis and can be grouped into general service categories as follows:

1. Inlet/Outlet and Channel Maintenance
2. Existing Facilities Repair
3. Facility Rehabilitation/Upgrades
4. Culvert Replacement and Roadway Rehabilitation
5. Bridge Rehabilitation/Replacement
6. Storm Drain Infrastructure Repair
7. Sedimentation/Retention/Water Quality Basin Maintenance & Repair
8. Jurisdictional Dam Operation and Maintenance

The operations and maintenance categories listed above and further described below are essential in the proper and efficient function of the City infrastructure. These activities will not receive funding from the revised PLDA Fee program.

2.8.1 Project Categories

The following sections provide more details on each operations and maintenance category, including the frequency of the activities associated with each category.

2.8.1.1 Category 1: Inlet/Outlet and Channel Maintenance

Under this category, routine maintenance activities may include vegetation control (native and non-native species), tree trimming, and debris removal including trash, rocks and sediments. Maintenance required for the control of vegetation and removal of sand, silt, debris, and other obstructions to outlets is typically conducted on an annual basis; however, these activities may be performed more frequently.

Vegetation control is required within drainage facility bottoms, banks and roads to maintain the drainage design flow and conduct facility inspections. Vegetation control is conducted by mechanical means, manual labor, or chemical application. Mechanical means includes using equipment such as a gradall and/or backhoe that is set up along the roadway shoulder. Vegetation is removed in a manner that avoids excavation activity. Vegetative material is placed in trucks and hauled offsite to approved locations. Manual labor includes the use of handheld tools such as chainsaws, mechanical mower, shovels, etc. Chemical application involves the infrequent application of Roundup®, typically during dry weather periods, around guardrail, signs and dry ditches or other areas where the flow may be restricted by vegetative growth to the point where the roadway may become flooded.

The removal of trees or branches that are in imminent danger of falling or likely to fall during high flows, fallen trees obstructing flow, and associated debris, are performed on an as needed basis. Trimming, pruning, shaping, or removal of trees is conducted by a qualified tree trimmer per the best standards of arboriculture. Stumps are removed to eight inches below the surface when necessary.

Trash and other debris clearing are necessary at inlets/outlets and within channels to maintain the drainage facility design capacity. Trash and other debris can be removed with mechanical equipment or by manual labor.

Erosion from storm water runoff creates an accumulation of sediment build up around existing drainage facilities. The hydraulic flow of these facilities becomes impacted from the large build up of sediment. To retain capacity in the drainage facilities, it is necessary to periodically remove accumulated sediment. The removal of sediment would be limited to the minimum necessary to restore the waterway in the immediate vicinity of the drainage facility, but would not extend outside existing channel or inlet/outlet structure. It is noted that the removal of sediment and trimming of vegetation will usually extend no more than 10 to 20 feet from the pipe inlet/outlet to minimize impacts to the surrounding environment. Sediment removal is

normally conducted by a gradall, and/or backhoe from the roadway shoulder. Where feasible, an articulating front end loader (Caterpillar 950) is used. The bucket is extended down and sediment or debris is scooped out. Sediment and debris is then placed in trucks and hauled to approved locations. At drainage inlets or junction structures, where confined space limits access to larger equipment, Vactor® trucks are used to vacuum out sediment or debris. In addition, sediment may also be removed from small culverts by hand, using shovels.

2.8.1.2 Category 2: Existing Facilities Repair

Repairs to existing facilities include work related to stormdrains, culverts, inlets/outlets, channels, brow ditches, basins, existing erosion control features including fiber rolls, silt fences, erosion control blankets, hydroseed, and structural Best Management Practices (BMPs [sediment/detention basins, bio-strips, bioswales, and check dams]), for roadways and other drainage facilities previously described. Activities for roadway repair associated with a drainage structure include leveling of soil surface, filling ruts, and repairing the roadway shoulder or dike. This work is normally done from the adjacent lane of the roadway and does not go outside of the paved shoulder, with the exception of pulling out excess deposition or material that washed in or off the adjacent slope area. It may also be necessary to perform mechanical repair or replacement of structural BMPs, including revegetating bio-strips and bio-swales. Facility repair may also include, but not be limited to, repairing scoured channel bottoms, bridge piers and abutments, damaged headwalls, concrete aprons, damaged spillways, curb inlets, brow ditches, broken pipes and energy dissipaters. The City's maintenance staff currently repairs channel bottoms by using a front-end loader, trackhoe, backhoe, or a small dozer. Some of the equipment can work from the side of the roadway to access the channel, while some work may need to be done in the channel itself depending on accessibility, the size of the channel, etc. Repair of unpaved channel bottoms can include the installation of rip-rap or concrete lining depending on the amount of damage. Rock/rip-rap removal and placement is most commonly done using a front-end loader or a motor grader, and work can be accomplished from the roadway shoulder by either picking up or placing rock/rip-rap into/from the channel.

2.8.1.3 Category 3: Facility Rehabilitation/Upgrades

Facility upgrades include projects such as sediment/detention basin upgrades (increase in size and/or depth), culvert replacements (increase in size, diameter or type of culvert), culvert slip lining (to maintain line and grade where feasible), access to drainage facilities, construction and upgrades to erosion control features and structural BMPs, and implementation of new erosion control devices adjacent to existing culverts or bridges (fiber rolls, wattles, mats, erosion control blankets, rock slope protection, silt fences, hydroseed, etc.). Check dams and stilling basins require excavating soil within the wash or channel and its bank, and placing concrete or rock slope protection (bank armoring). Typical material used for the placement of rock slope protection is filter fabric with a Class II backing (3 to 6 inch diameter) and rip-rap (18-inch diameter or greater). This activity would be accomplished with a backhoe, loader, gradall, and/or small dozer. Temporary access to the channel may be necessary. Sediment catch basins could require excavating areas on the inlet side of culverts or ditches, and constructing dikes to direct the flow of water.

2.8.1.4 Category 4: Culvert Replacement and Roadway Rehabilitation

Culvert replacement and roadway rehabilitation consists of replacing/retrofitting failed culverts with the same size/diameter culvert (essentially replacing in-kind) and extending culverts. In addition, rock slope protection will be included to minimize runoff velocities at the outfall. Replacement work typically requires excavation above existing pipes, removing and replacing pipes, and backfilling of new culverts with a paved structural section. The structural section can be constructed of asphalt concrete or Portland cement concrete to match existing site conditions. Rock slope protection is placed at the outfall of the culvert to aid in velocity reduction, minimizing scour downstream. Temporary access routes and staging areas used for equipment, and material storage and spoils disposal are included.

2.8.1.5 Category 5: Bridge Rehabilitation/Replacement

Bridge rehabilitation consists of removing the asphalt concrete (AC) deck or replacing decks, reconstructing approaches, bridge abutments and column protection, applying a seal coat, and sand blasting the underside of the bridge to inspect for damage. In addition, replacement of dikes, barrier rail and other appurtenances that direct runoff to an inlet must be maintained and functioning so that runoff does not pond and create a nuisance to the motoring public. Bridge replacement consists of removing and replacing the entire bridge structure with a new bridge; removal requires excavation. Temporary access roads may be needed to access the area underneath the bridges. Some bridge rehabilitation work may require installing temporary traffic detours across the bridge; detours would include construction of drainage structures to divert runoff from the construction site.

2.8.1.6 Category 6: Storm Drain Infrastructure Repair

Curb inlets and junction structure replacement consists of replacing/retrofitting damaged or aging drainage inlets, sidewalk underdrains, manholes and junction structures with the same size facility (essentially replacing in-kind) for the purpose of providing safe, accessible access to the maintenance personnel. Storm drain structure replacement consists of removing and replacing the entire structure and its appurtenances with a new drainage inlet, manhole and/or junction structure. Removal of these features requires excavation and would be accomplished with a backhoe, loader, gradall, and/or small dozer. Backfill with Class II base, formwork and concrete work will be required to complete the task.

2.8.1.7 Category 7: Sedimentation/Retention/Water Quality Basin Maintenance & Repair

Basin maintenance and repair consists of removal activities that may include vegetation and debris removal including trash and other deleterious material. Maintenance required for concrete lined basins include the use of epoxy sealant, concrete patching of damaged areas, cleaning or replacement of inlet and outlet structures and graffiti removal. Inspections and repairs are conducted on an annual basis; however, these activities may be performed more frequently since they are dependent on the amount of rainfall received during the season.

Maintenance required for unlined basins include the removal of vegetation, sand, silt, debris, and other deleterious material. Maintenance requires the use of a gradall, and/or backhoe for sediment removal. Where feasible, an articulating front end loader (Caterpillar 950) is used. The removal of sediment is needed to restore the basins to their design capacities. Sediment and debris are removed and then placed in haul trucks and disposed of in approved locations. Side slopes are repaired as the need arises.

2.8.1.8 Category 8: Jurisdictional Dam Operation and Maintenance

The California Water Code entrusts the regulatory Dam Safety Program to the Department of Water Resources, Division of Safety of Dams (DSOD). The principal goal of this program is to prevent dam failure, thus safeguarding life and protection of property. Dams under State jurisdiction are an essential element of the California infrastructure that provides constant water supply integrity as well as essential flood control. The DSOD inspects and evaluates each dam and reservoir during construction to verify compliance with the approved plans and specifications and to assure that changes or unforeseen foundation conditions are recognized and the design is modified as necessary. The DSOD inspects, monitors, and evaluates operational dams annually or more frequently as necessary to assure safety. The DSOD issues a Certificate of Approval for each dam and reservoir, containing operational restrictions if necessary for safe use.

Dam maintenance typically includes inspections, repairs, rehabilitation and/or improvements, and documentation of all observations and activities. General inspections of outlet pipes and structures for leaks and deterioration, telemetry equipment, pumps, water treatment facilities, BMPs and spillways are typically

carried out as part of a systematic inspection process. Other maintenance repairs and general housekeeping activities include minor channel and bank stabilization, resurfacing of the embankment slopes, trash and debris removal, vegetation removal within the dam embankment and around the emergency spillway. Maintenance activities may also include rodent abatement, trimming and removal of vegetation from the access roads to the spillway and associated structure.

Rehabilitation and/or improvements include repairing the top and face of the dam structure and associated maintenance access roads, painting, lubrication or replacement of structural and/or mechanical components such as gates, valves or piping, and replacement of electrical equipment.

Dam operational activities include the "exercising of valves" which encompasses the opening and closing of pipe valves to raise and lower the water surface elevation of the impounded water. This activity is also performed to ensure that valves do not freeze up. In addition, testing of primary, as well as secondary, equipment for drawdown of water is essential to the health and operation of the dam. This activity is performed to maintain capacity within the impoundment. In the case of the Calavera Dam facility, the City intends to raise and lower the water surface elevation in anticipation of winter rains to maximize flood protection for downstream property owners. Documentation on the actual operations shall include data on reservoir levels, inflow and outflow, drainage system discharge and structural behavior. The operation of Calavera Dam as a flood control facility will be accomplished in compliance with the Annual Management and Daily Operations Plan for Lake Calavera as prepared by the Carlsbad Municipal Water District.

2.9 Environmental Issues

Environmental issues have been tentatively identified by comparing proposed project locations and proximity of habitats around the various project components using current GIS mapping. Based on the comparison, the sensitive habitats that would potentially be impacted include: wetlands (e.g., riparian scrub/woodland and marsh), jurisdictional non-wetland waters of the U.S. (e.g., unvegetated drainage channel), and particular upland habitats such as coastal sage scrub, chaparral, and native and nonnative grassland.

Expected costs for in-place physical restoration of non-wetland waters and revegetation of wetlands temporarily impacted during construction range between $15,000 and $90,000 per acre (low end for physical restoration only) including up to 5 years of maintenance and monitoring for revegetation. Expected costs for in-place revegetation of sensitive uplands temporarily impacted during construction range between $40,000 and $80,000 per acre including 5 years of maintenance and monitoring.

Offsite habitat mitigation to compensate for permanent impacts (and also potentially for the temporal loss associated with temporary impacts) is typically more expensive than in-place revegetation/restoration because offsite mitigation usually requires additional site preparation (e.g., exotics removal and/or grading) and often requires an endowment for long-term management. Depending on property ownership, offsite mitigation can also include land purchase costs and/or costs associated with recording an open space easement.

Expected costs for offsite wetland mitigation and non-wetland waters (permanent impacts to non-wetland waters are typically mitigated offsite with vegetated wetlands) range between $75,000 to $170,000 per acre including 5 years of maintenance and monitoring. A one time endowment fee, with a range of $60,000 to $200,000+ per acre (placed in an interest bearing account) may also be required for long-term management. Additional property and easement costs could range from $50,000 to $200,000+ per acre. If wetland mitigation bank credits are available, expected costs could range between $220,000 to $300,000 per acre. Mitigation bank costs per acre credit are inclusive and do not require additional fees for long-term management, property, or easement fees.

Expected costs for offsite upland mitigation range between $45,000 to $100,000 per acre including 5 years of maintenance and monitoring. A one time endowment fee between $20,000 and $100,000 per acre may also

be required for long-term management; and additional property and easement costs could range from $40,000 to $90,000+. If upland mitigation bank credits are available, expected costs could range between $30,000 to $100,000+ per acre.

Based on current GIS mapping, habitat proximity, trends in mitigation costs and probable construction impacts to the environment, expected costs for mitigation range between $60,000 and $130,000 per acre of disturbance, with an average cost of $95,000. This translates to an average cost of 10 to 20 percent mitigation per project.

Due to the variability of individual project features, environmental mitigation and compliance associated with construction, including but not limited to, construction footprint, erosion control, storm water control, contractor education, and environmental monitoring and reporting, these environmental costs cannot be included in project construction costs estimates. However, a cost for environmental compliance can be assigned to a project based on anticipated permit requirements.

2.9.1 Tiered Permit Costs for PLDA Projects

As discussed above, mitigation for temporary and permanent impacts to sensitive habitats can only be specifically determined for each proposed project on a case by case basis. Typical costs can range from $15,000 and $200,000 per acre, depending on environmental studies required, sensitive species encountered and environmental conditions identified in the field.

Irrespective of mitigation costs, the analysis does provide insight to the permits that will be required. Typical costs for the US Army Corps (404 Permit) permits can fall between $4,000 to $25,000, depending on the level of complexity, analysis and size of project. Similarly, the Regional Water Quality Control Board permit costs range from $5,000 to $15,000, a Streambed Alteration Agreement from the Department of Fish and Game can cost from $10,000 to $25,000, and a California Coastal Commission Development permit can cost $5,000 to $10,000.

The proposed master planned projects discussed in Section 2.5 along with their associated permits have been identified in Table 2.9-1. Average project costs for the necessary environmental permits have been determined for the individual projects identified in Table 2.9-1. The average permit costs will be discussed in Chapter 4 (Cost Estimates) and have been incorporated into the cost estimates in Appendix B.

Table 2.9-1. Drainage Master Planned Projects and Associated Permits

Master Planned Project	US Army Corps of Engineers (404 or NWP) Permit	Regional Water Quality Control Board (401) Permit	California Department of Fish & Game (Streambed Alteration) Permit	California Coastal Commission Development Permit	Onsite Environmental Mitigation Permit	Offsite Environmental Mitigation Permit
BASIN A						
AAA					X (Review)	
AAAA					X (Review)	
AC	X		X	X	X (Review)	
AFA	X	X	X			X
AFB	X	X	X		X	
BASIN B						
B	X	X			X	X
BB-1					X (Review)	
BB-2					X (Review)	
BCA						
BCB						
BCC						
BFA						
BFB-U						
BFB-L						
BF1						
BJ			X		X	
BJB			X		X	
BL-U						
BL-L						
BM				X (Uplands)	X	
BN	X	X	X		X	X
BNB						
BP				X (Uplands)	X	
BQ				X (Uplands)	X	
BR				X	X	
BASIN C						
C1				X (Review)		
C2	X	X	X	X	X	
CA				X (Review)		
BASIN D						
DBA				X (Review)		
DBB				X (Review)		
DFA	X	X	X (Prescribe)	X	X	
DH			X (Prescribe)		X	
DQB			X (Uplands)		X	
DZ			X (Uplands)	X	X	

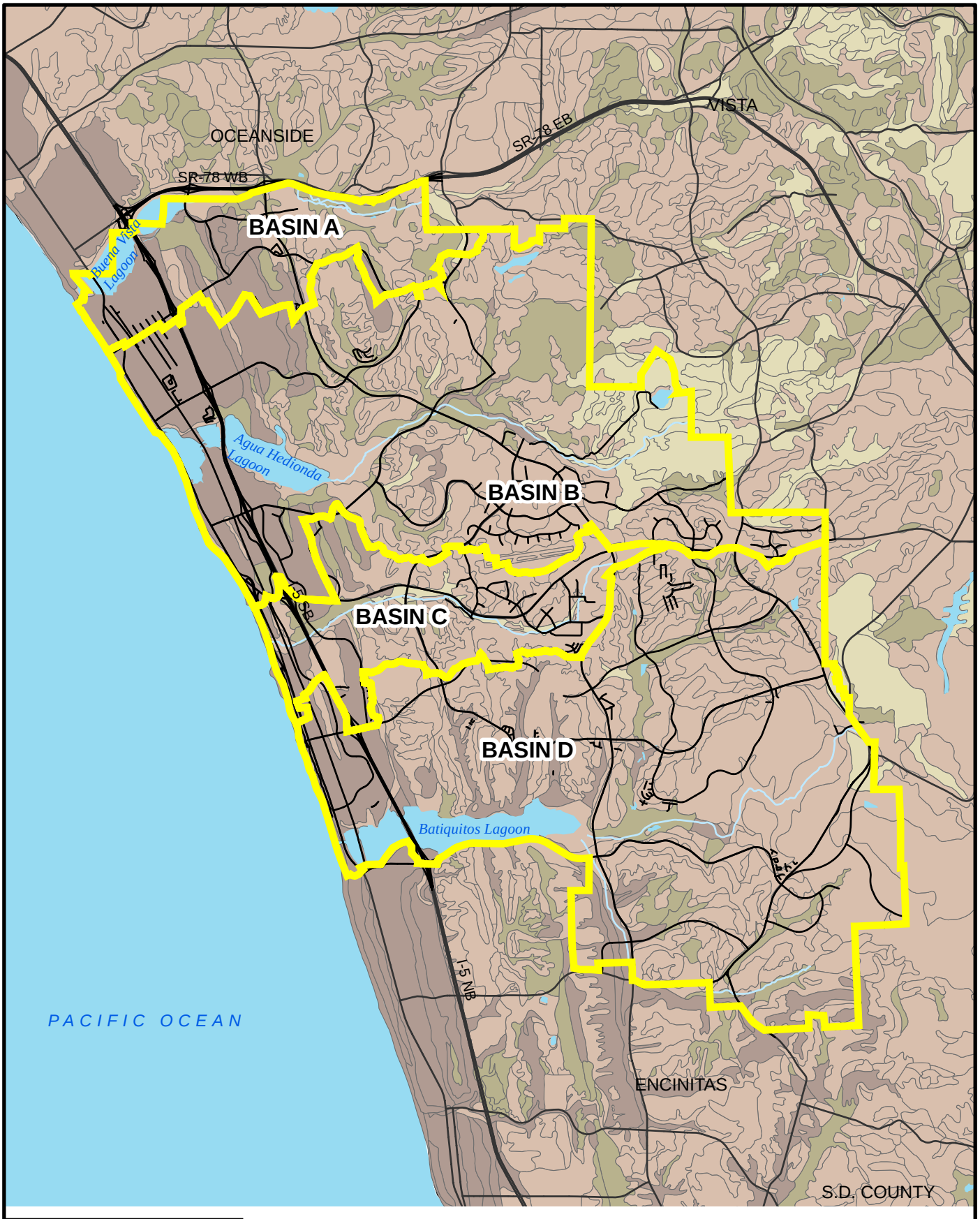
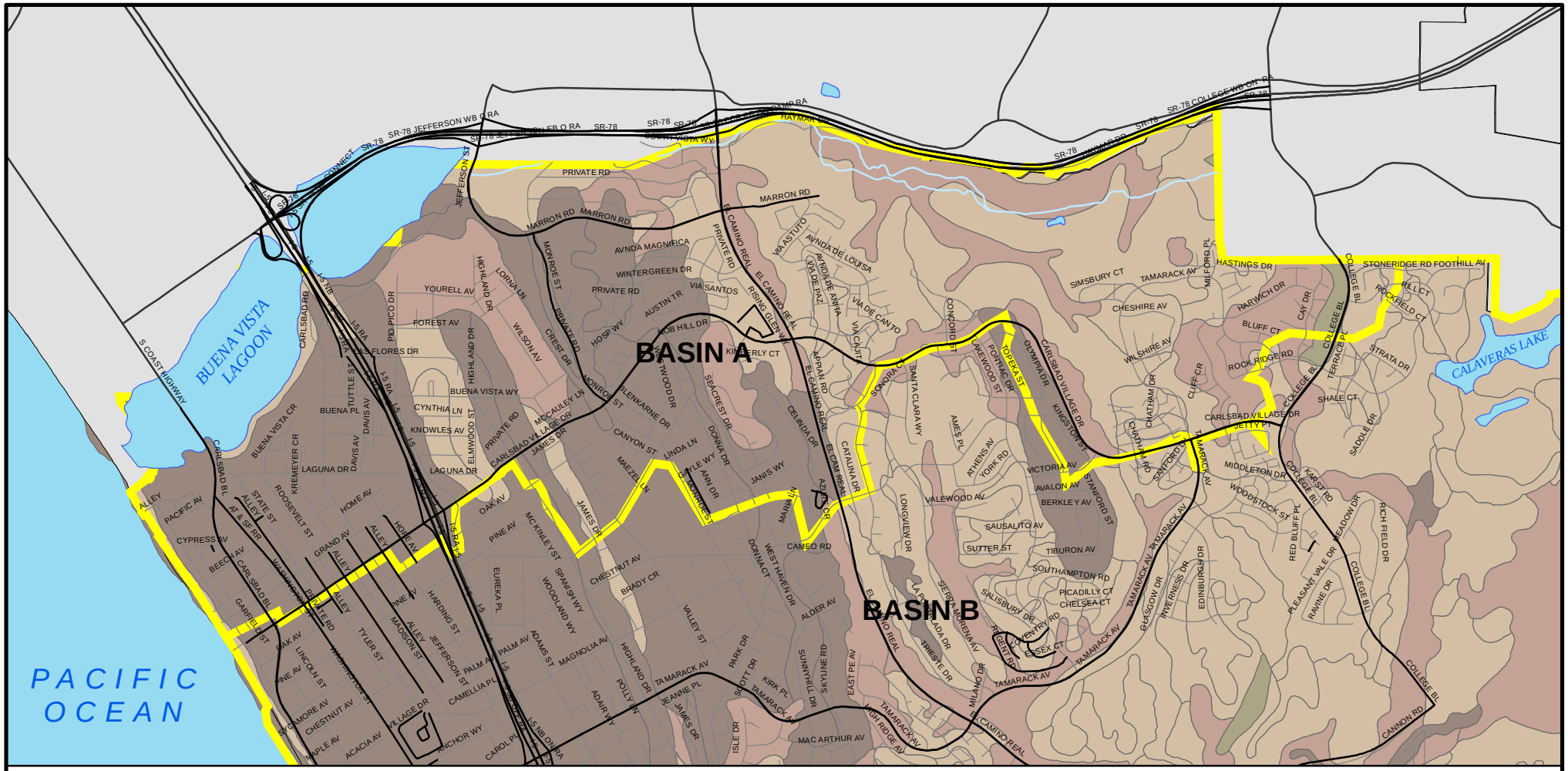


FIGURE 2 - 1

BASINS A, B, C, AND D
SOIL GROUPS AND HYDROLOGIC FEATURE

PROJECT LOCATION	DATE	PROJECT NUMBER
CARLSBAD, CALIFORNIA	NOV 2007	12829

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA



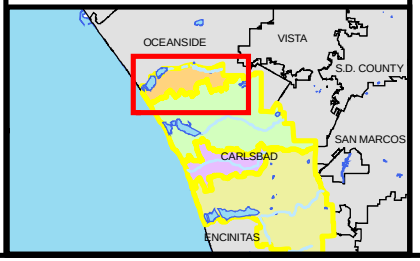
LEGEND

- CREEKS
- FREEWAY
- MAJOR ROADS
- BODY OF WATER
- DRAINAGE BASINS

DRAINAGE BASINS: A, B, C, D

SOIL: A, B, C, D

KEY MAP



N W E S

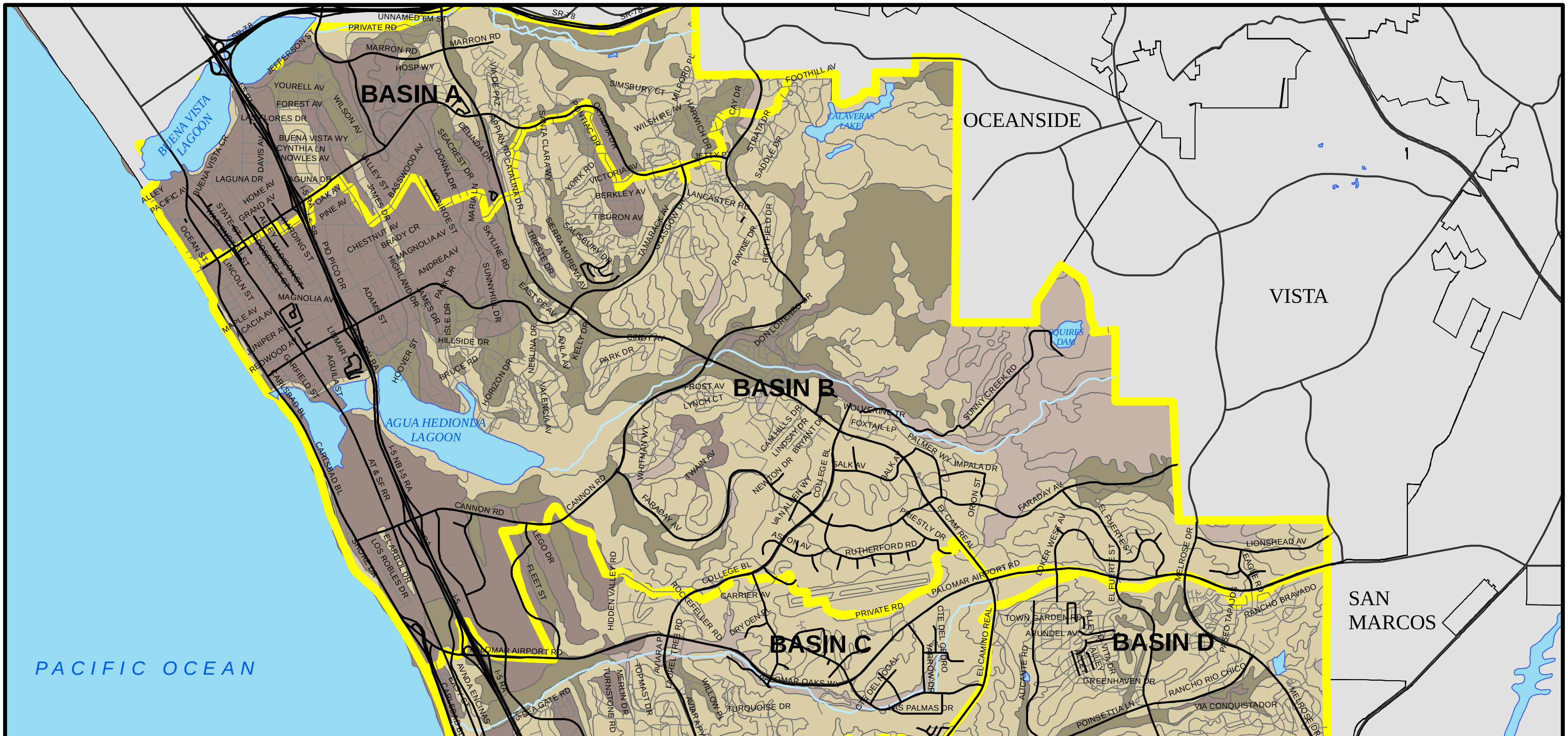
0 1,250 2,500 5,000 Feet

FIGURE 2 - 2

BASIN A
BUENA VISTA CREEK
SOIL GROUPS AND HYDROLOGIC FEATURES

PROJECT LOCATION	DATE	PROJECT NUMBER
CARLSBAD, CALIFORNIA	NOV 2007	128290

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

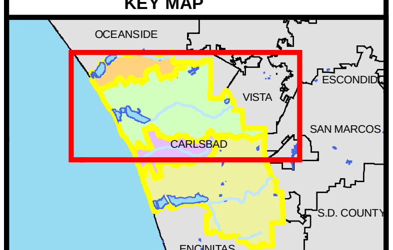


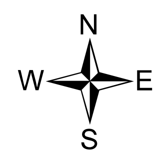
LEGEND

- CREEKS
- FREEWAY
- MAJOR ROADS
- BODY OF WATER
- DRAINAGE BASINS

DRAINAGE BASINS	SOIL
A	A
B	B
C	C
D	D

KEY MAP



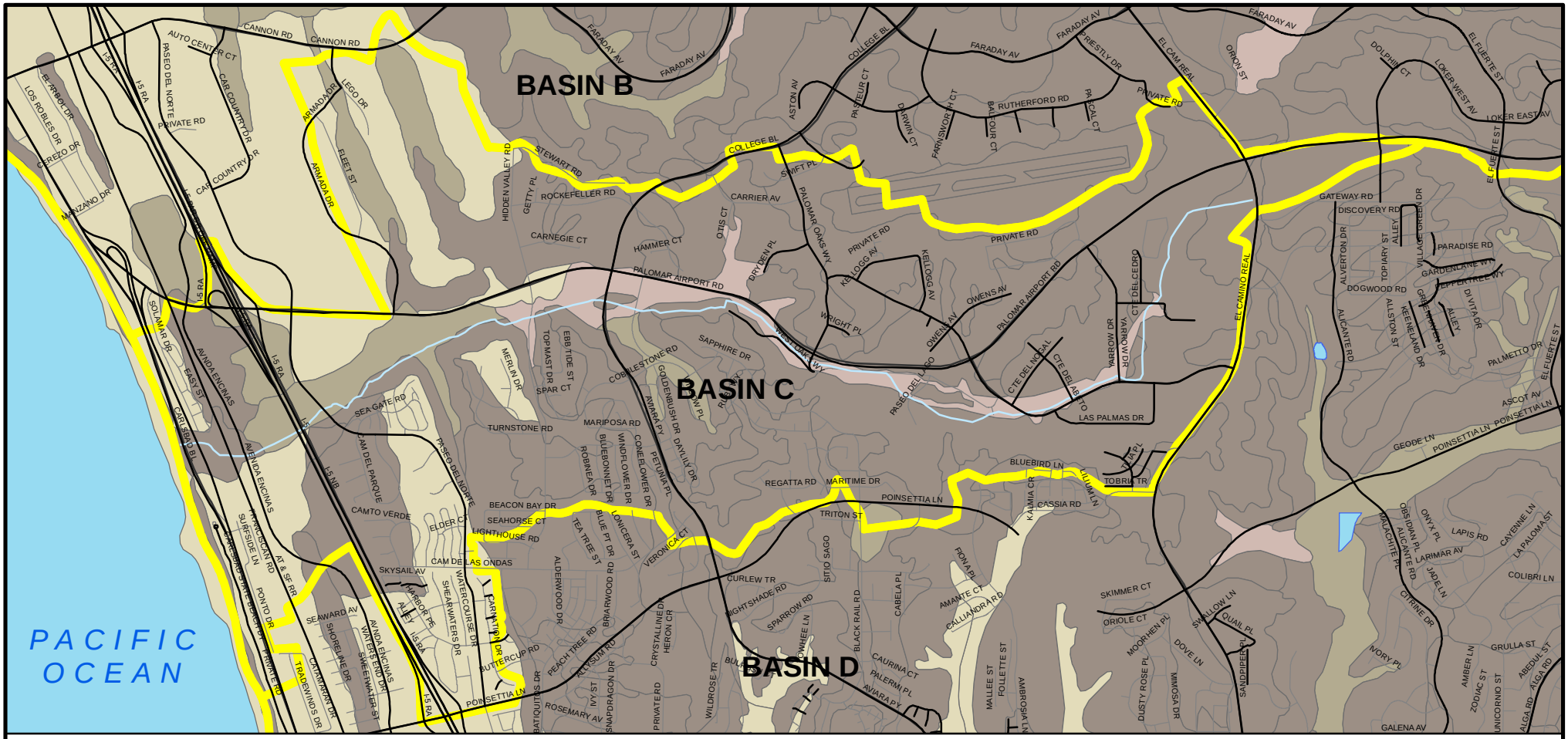


0 2,750 5,500 11,000 Feet

FIGURE 2 - 3
BASIN B
AGUA HEDIONDA CREEK
SOIL GROUPS AND HYDROLOGIC FEATURES

PROJECT LOCATION	DATE	PROJECT NUMBER
CARLSBAD, CALIFORNIA	NOV 2007	128290

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

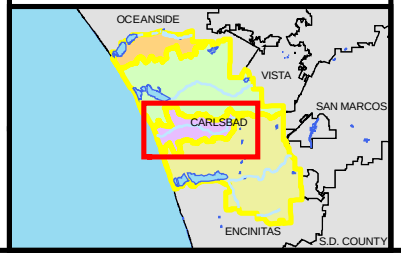


LEGEND

- CREEKS
- FREEWAY
- MAJOR ROADS
- BODY OF WATER
- DRAINAGE BASINS

DRAINAGE BASINS	SOIL
A	A
B	B
C	C
D	D

KEY MAP



N
W E
S

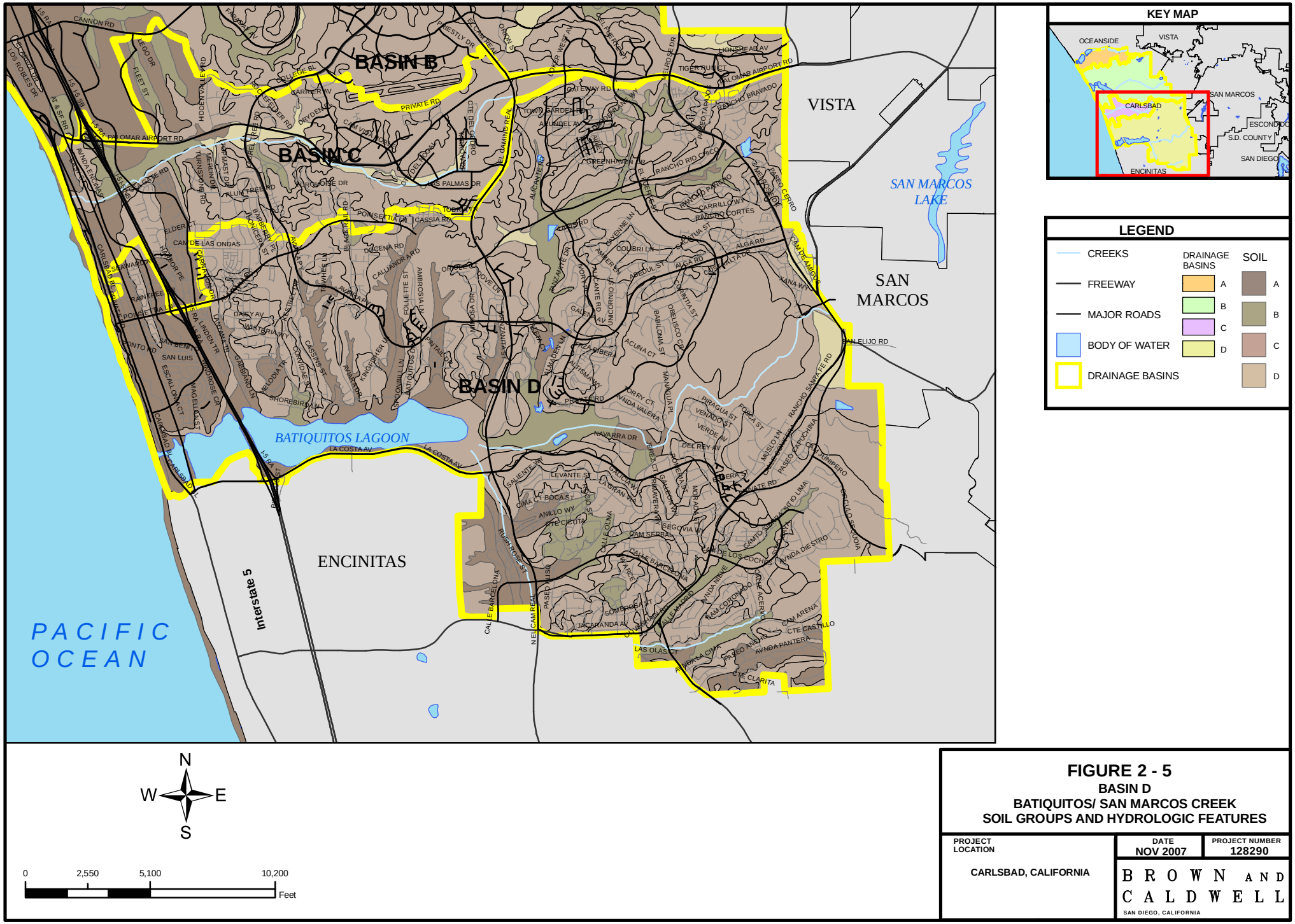
0 1,250 2,500 5,000 Feet

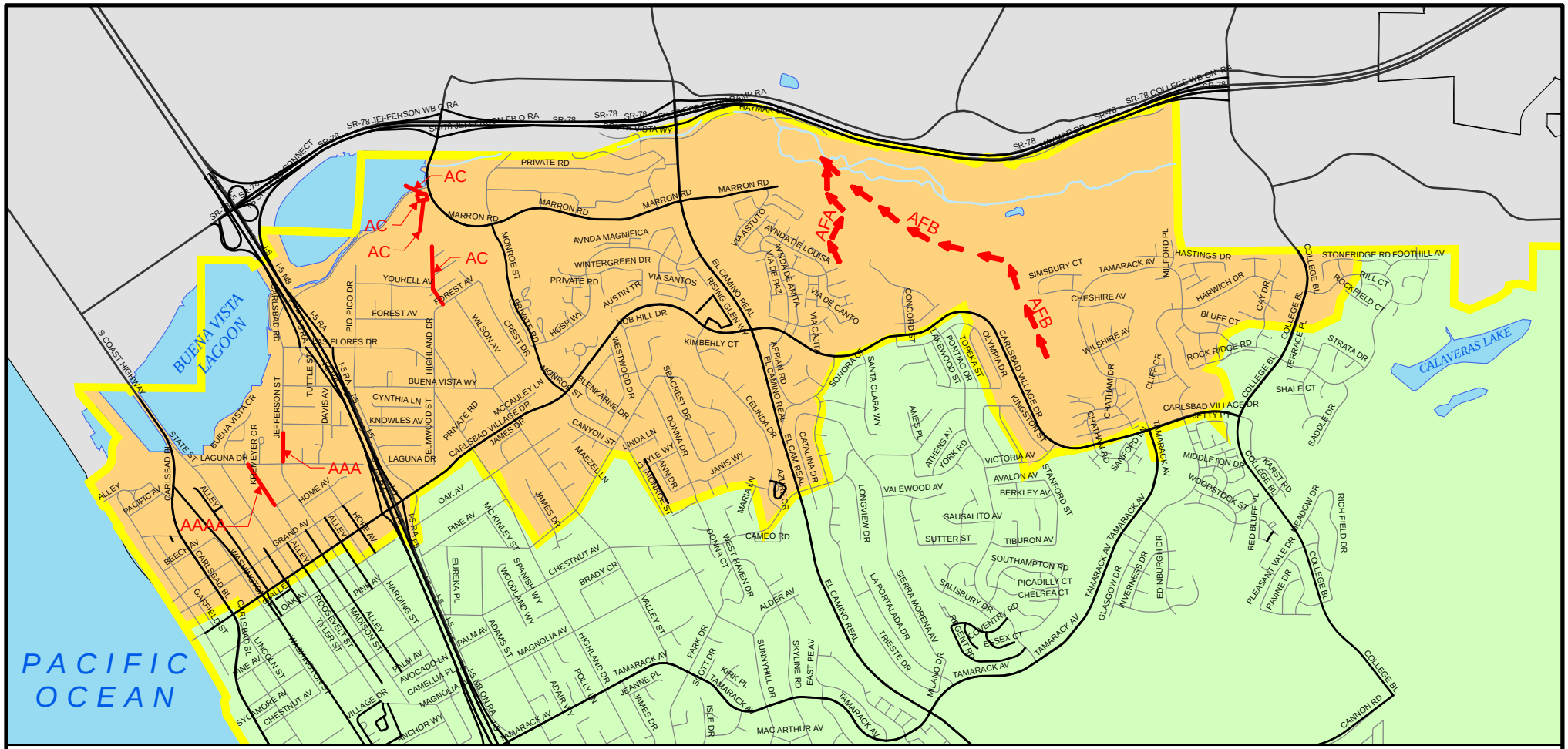
FIGURE 2 - 4

BASIN C
ENCINAS CREEK
SOIL GROUPS AND HYDROLOGIC FEATURES

PROJECT LOCATION	DATE	PROJECT NUMBER
CARLSBAD, CALIFORNIA	NOV 2007	128290

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA


KEY MAP
OCEANSIDE
VISTA
SAN MARCOS
CARLSBAD
ESCONDIDO
S.D. COUNTY
SAN DIEGO
ENCINITAS
LEGEND
CREEKS
FREEWAY
MAJOR ROADS
BODY OF WATER
DRAINAGE BASINS
DRAINAGE BASINS
SOIL
A
B
C
D
A
B
C
D
BASIN B
BASIN C
BASIN D
VISTA
SAN MARCOS
ENCINITAS
SAN MARCOS LAKE
BATIQUITOS LAGOON
PACIFIC OCEAN
Interstate 5
N
W
E
S
0
2,550
5,100
10,200
Feet
FIGURE 2 - 5
BASIN D
BATIQUITOS/ SAN MARCOS CREEK
SOIL GROUPS AND HYDROLOGIC FEATURES
PROJECT LOCATION
CARLSBAD, CALIFORNIA
DATE
NOV 2007
PROJECT NUMBER
128290
BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

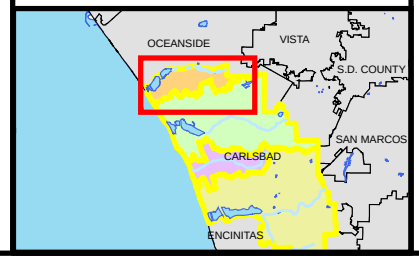


LEGEND

- CREEKS
- FREEWAY
- MAJOR ROADS
- BODY OF WATER
- DRAINAGE BASINS
- PROPOSED PLDA PROJECTS

DRAINAGE BASINS: A, B, C, D

KEY MAP



N W E S

0 1,375 2,750 5,500 Feet

FIGURE 2 - 6
BASIN A
PROPOSED PLDA PROJECTS

PROJECT LOCATION	DATE	PROJECT NUMBER
CARLSBAD, CALIFORNIA	NOV 2007	128290

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

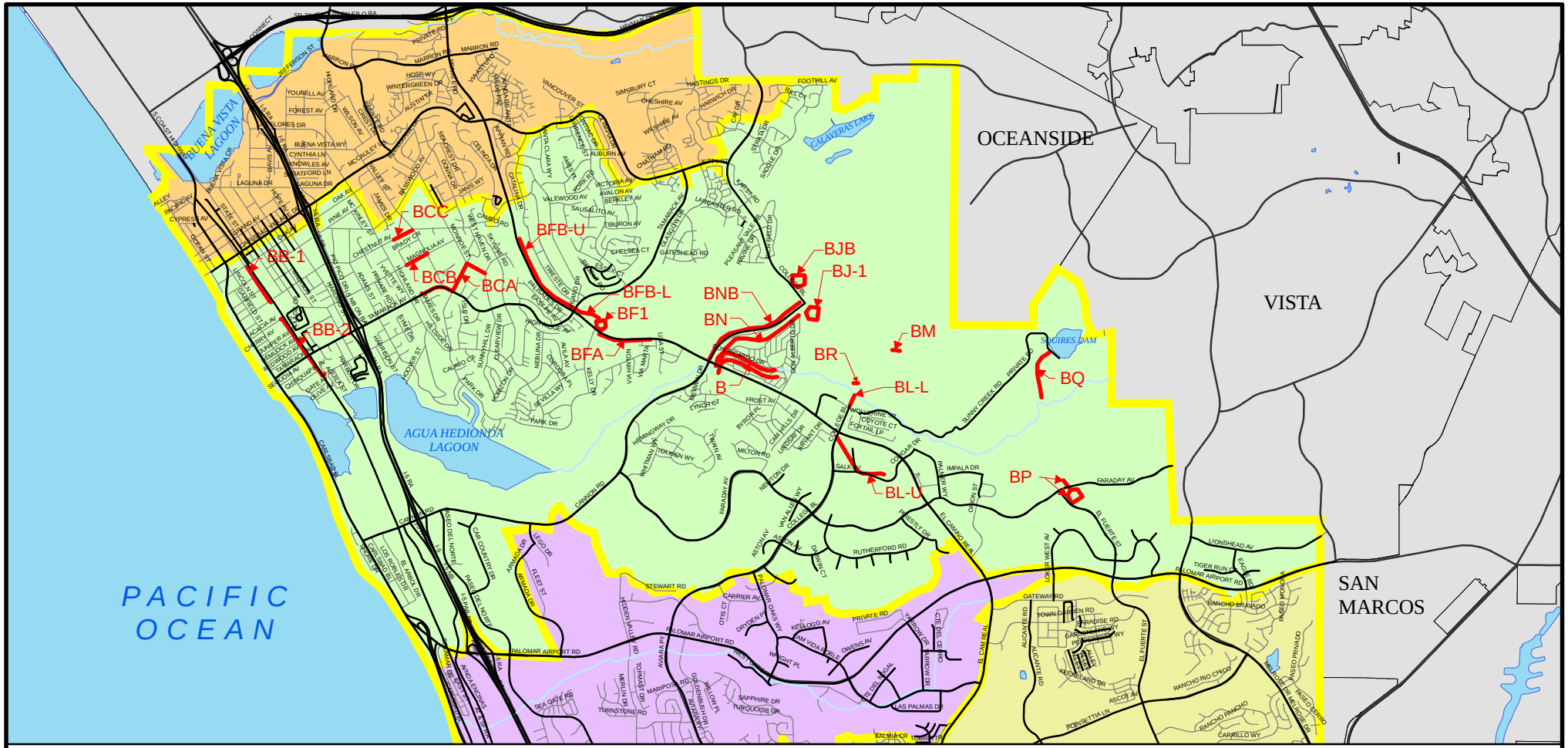


FIGURE 2 - 7
BASIN B
PROPOSED PLDA PROJECTS

PROJECT LOCATION	DATE	PROJECT NUMBER
CARLSBAD, CALIFORNIA	NOV 2007	128290

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

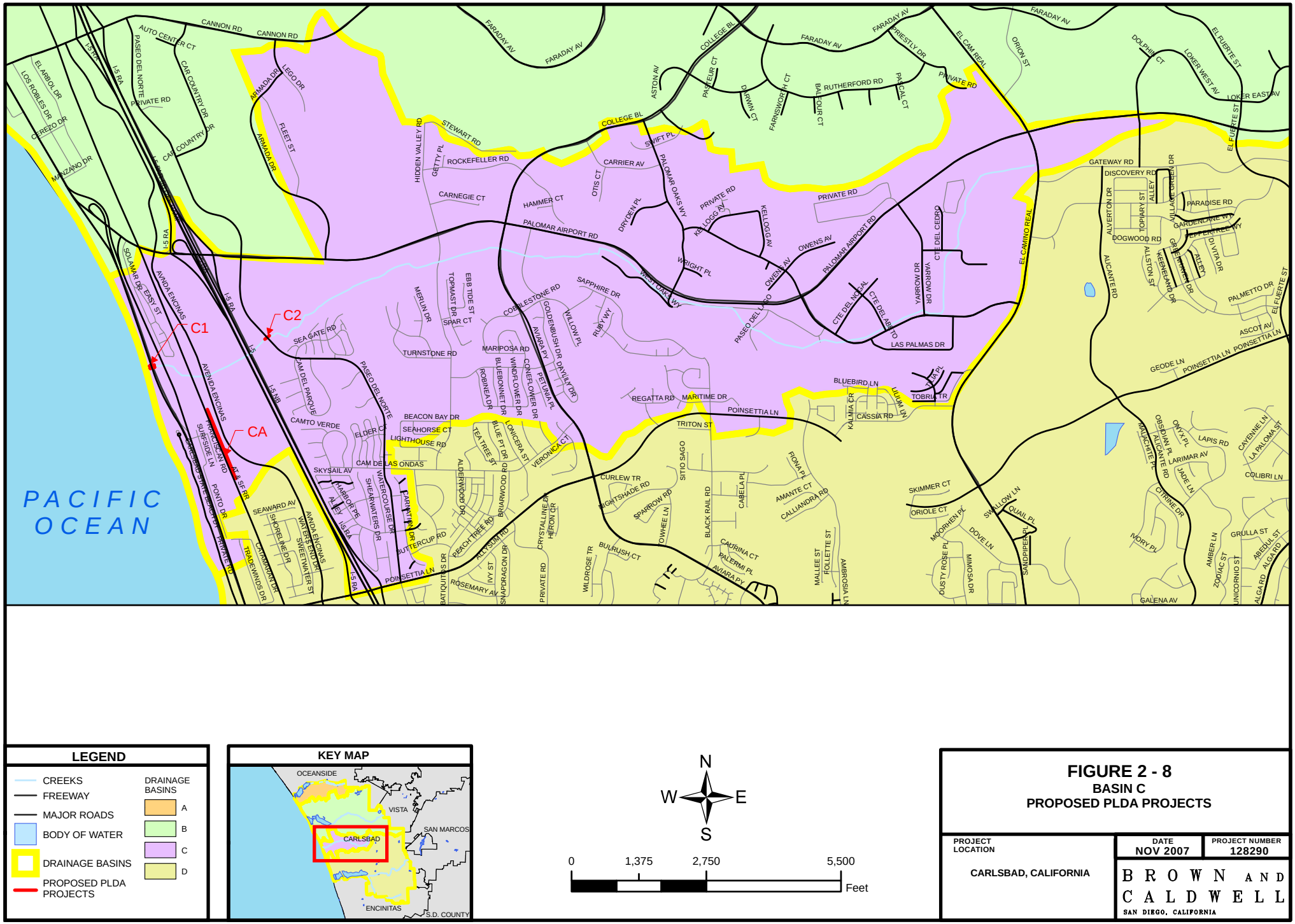


FIGURE 2 - 8
BASIN C
PROPOSED PLDA PROJECTS

PROJECT LOCATION	DATE	PROJECT NUMBER
CARLSBAD, CALIFORNIA	NOV 2007	128290

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

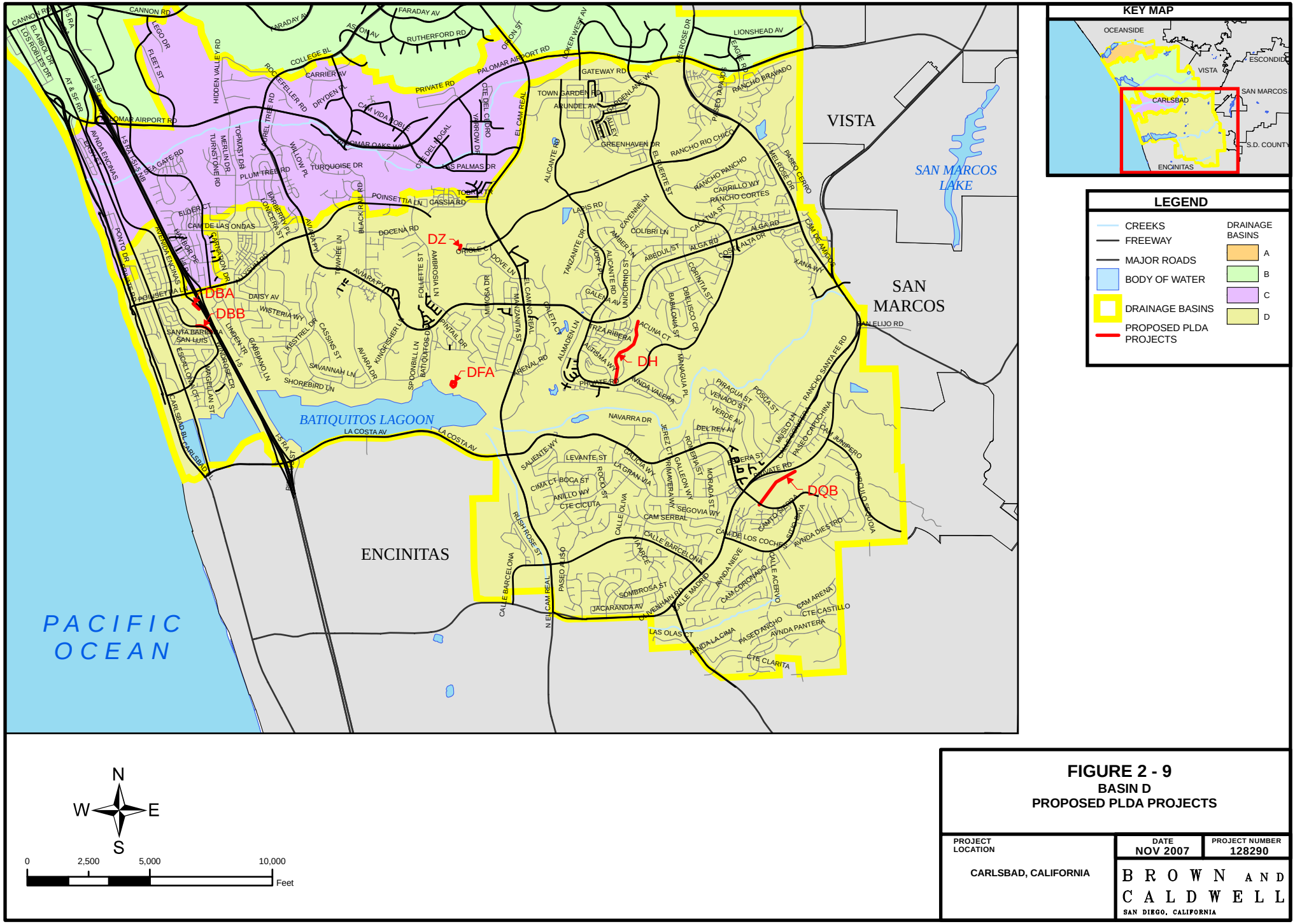


FIGURE 2 - 9
BASIN D
PROPOSED PLDA PROJECTS

PROJECT LOCATION	DATE	PROJECT NUMBER
CARLSBAD, CALIFORNIA	NOV 2007	128290

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

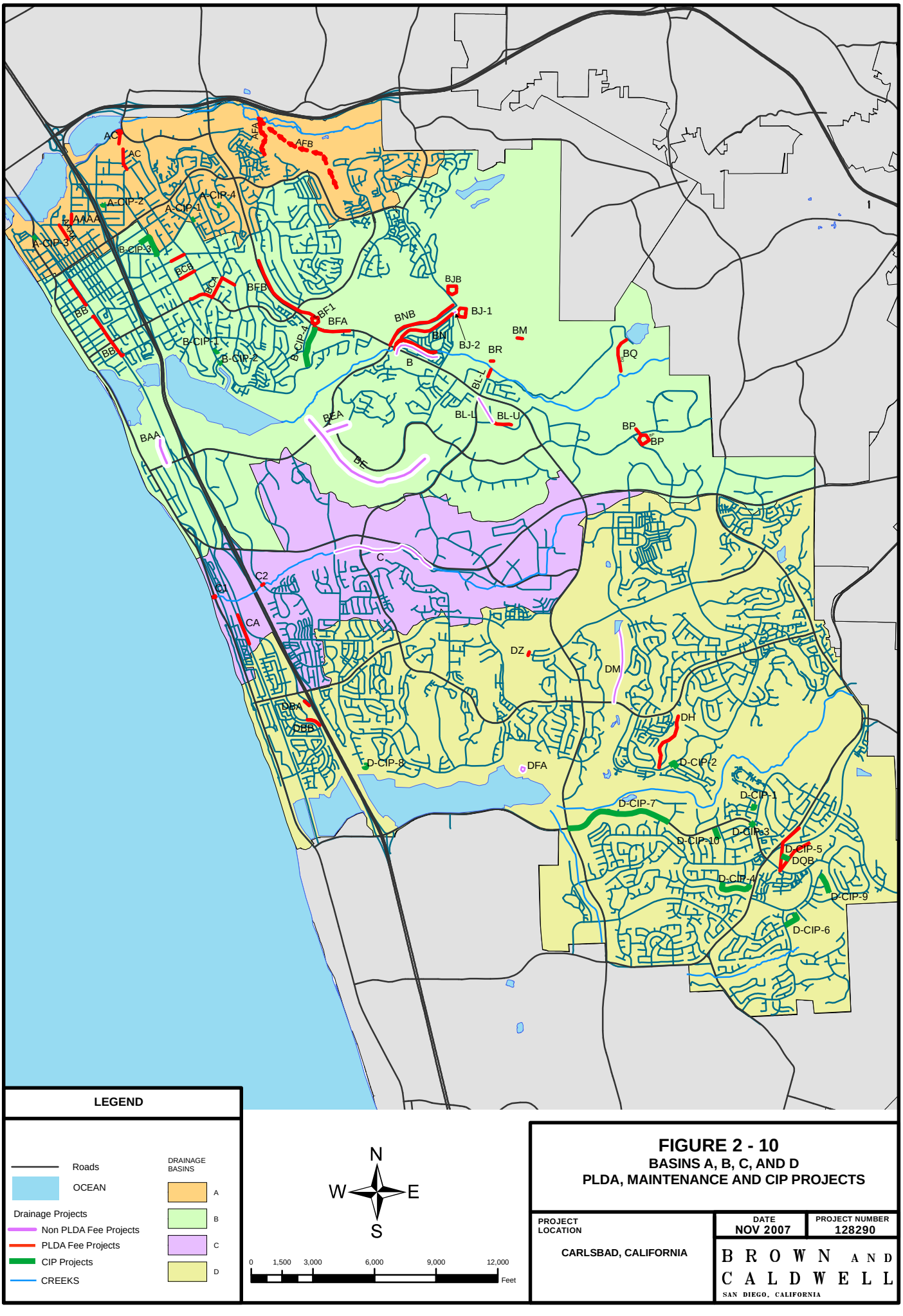


FIGURE 2 - 10

BASINS A, B, C, AND D
PLDA, MAINTENANCE AND CIP PROJECTS

PROJECT LOCATION	DATE	PROJECT NUMBER
CARLSBAD, CALIFORNIA	NOV 2007	128290

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA